RAILROAD GAZETTE

FRIDAY, APRIL 25.

CONTENTS.

ILLUSTRATIONS:	PAGE.
The Needles Bridge (with inset)	278
The Locomotive "Pioneer"—St. Andrews & Quebec R. R.	279
Standard High Trestle—Oregon & Washington Territory R. R.	281
Locomotive Counterbalancing.	283
CONTRIBUTIONS:	
Brake Shoe Wear on Chilled Wheels	277
Electric Train Signaling	277
Position of Steam Heating Couplers	277
Easement Curves	277
EDITORIALS	
The Inter-state Commerce Commission on Cotton Rates	286
American and English Locomotives	286
The Bridges over the Harlem River	288
March Accidents	288
EDITORIAL NOTES	282, 288
TRADE CATALOGUES	289
GENERAL NEWS:	
Technical	290
The Scrap Heap	285
Locomotive Building	291
Car Building	291
Bridge Building	291
Meetings and Announcements	292
Personal	293
Elections and Appointments	293
Railroad Construction	293
Old and New Roads	295
Traffic	296
MISCELLANEOUS	
Standard Rail Sections	277
Some of the Carnegie Works	279
Wooden Trestle Bridges	280
Train Accidents in March	280
A Ride over the Pennsylvania	282
The Strong Locomotive	284

Contributions.

Brake Shoe Wear on Chilled Wheels.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In speculating as to the probable results of the tests of the brake shoe committee appointed by the Master Car Builders' Association it has occurred to me that they may find some difficulty in measuring the wear of the wheels, particularly chilled wheels. From any information that I can collect or deduce from records, I can only conclude that a brake shoe wears a chilled wheel but a very small amount, not sufficient to enable a measurement to be made of the amount of wear. Certainly no scales could be made delicate enough to determine any loss in weight, and the difficulty of making infinitesimal measures on the treads of the wheels seems almost insurmountable. It has occurred to me that possibly you have some information, or can obtain for me data as to the actual amount of wear of chilled wheels, in ordinary service, produced by the brake shoes. The wear of the shoes is quite apparent and easily measured; but the wear of the wheel, it seems to me, is too small to permit of even an estimate.

Can you tell me if the centre wheels of six-wheel trucks which have no brake shoes wear less rapidly than the other two wheels? I am told on good authority that they all wear nearly alike. BRAKE SHOE.

Electric Train Signaling.

BOSTON, April 19, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your editorial reply of April 18 to the correspondent who asked if "the Bay View disaster would have been averted had the train been equipped with an electric signal" was clear and comprehensive, but you judiciously leave the matter an open question when you say "that it *probably* would not."

Taking advantage of this opportunity, I give your readers an idea of how the accident referred to *could* have been averted by the use of an electrical train signal, such an one as is now on the Eastern market. I will suppose the train to be equipped with this device, and, for fact and brevity, state that it is an absolutely continuous wire from end to end of the train, though coupled between cars. The train was whole at one instant; at another it was broken. Now, the very second the break occurred and the derelict portion was three inches to the rear of the main section, the coupler pulled apart. Being an open-circuit device, this separation automatically closed it, and with the rapidity of a ray of light the gong rings continuously in the cab and alarms the engineer, who immediately reverses his engine and whistles for brakes. Even if the brakes were not applied on even grade, the rear section could not have been separated enough to have caused anything more than a jar, if it would that, for the rear would have readily been picked up in a couple of dozen yards, and as the front section would be in rapid motion at the time of the pick up, there could not have been an accident.

This whole matter has been proved three times recently on a Massachusetts road, and it is as impossible for the passenger or freight car to be separated five seconds, when broken, if this device is used, as it would be to check a current of electricity without cutting the wire when the positive and negative poles are united. This being a fact and endorsed as such by some of the most eminent railroad and electric experts, why is it not a wise thing to have it in use even in conjunction with the automatic brake system?

The editor in his article makes a good point on the bell cord, the uselessness of its functions, and with him I heartily hope that uncertain medium will, by law, be relegated to the hazy precincts of the wood stove and kerosene lamp. FRANK T. ROBINSON.

Position of Steam-Heating Couplers.

NEW YORK, April 21, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Under this heading in your issue of April 18 we notice, both in your remarks and also in the views expressed by several railroad men, great stress is laid on what you say has been called "an objection" to steam hose couplers being placed below the air brake hose, viz.: the "increased sag" and consequent liability to freeze on account of the accumulation of water of condensation.

You refrain from expressing a decided opinion on this point until more facts are to hand, and we take this opportunity to supply you with some which may enable you to place before your readers a decisive argument for the use of hose couplers for steam placed in the right position, viz.: under the air-brake hose.

We refer to the device named in the remarks of "A General Manager." This is literally an "automatic relief trap," and one of these traps is fitted to each coupling body. Now, when steam pressure is on, experience has shown that any condensation which may run into the couplings in no way interferes with the working of the system, for it is generally blown through by the steam and escapes through the regular traps. But the danger arises when steam is shut off and the water runs down to the lowest point, rapidly cools and freezes unless uncoupled immediately; and it is at this point that the necessity of this small trap is seen, for immediately steam is shut off a spring lifts the valve seat and opens the trap, when the water runs off. The trap remains open until steam is turned on, and the spring, which cannot resist ½ lb. of steam, gives way and the valve seat again closes up tight and does not admit of any escape of steam.

"A General Manager" remarks that "some railroad men say they are objectionable on account of leakage in the valve seats;" and further, "If a proper material can be found for these valve seats so as to prevent leakage, I believe, all points considered, it more desirable to have the couplings located underneath the platform." We have now a perfect valve seat, and receive no complaint from the great number of railroad men at present using them. One road alone, which has about 2,000 in use, says they are perfect. Of course, occasionally a seat gives out, but this is the exception. These traps can be fitted on to any coupling, and are indispensable where there is a "sag" for the water to collect; nothing else will protect the couplers. GOLD CAR HEATING CO.

Easement Curves.

CITY HALL, ST. LOUIS, April 14, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Allow me to call attention to the article on the above subject in your issue of April 4 by Wm. H. Brown, Chief Engineer of the Pennsylvania Railroad. He states in conclusion that he is "very much in doubt whether some of our scientific young men can retrace their elastic curves in the same place on the ground after the original points have been lost." Now, I am not so scientific as I hope to become, nor am I young. Still, youth is no crime; and it is possible to be scientific and practical at the same time. It seems to me high time that so-called theoretical engineers and so-called practical engineers stopped sneering each at the other. For each one of us the simple question is, "What can he do"? College-made engineers have no further time to dream of engineering harmonics; self-made engineers can waste no opportunity for learning first principles or advanced practices.

In the direction, then, of easement curves for railroad alignment, what now seems desirable, and what can railroad engineers do now in that direction? Railroad men will agree that it is to-day desirable to enter and leave our sharper curves with a less shock to rolling stock. Our high and increasing speeds make this necessary. Mr. Brown suggests a remedy and gives a plain sketch of it. It is certainly a material betterment over the ordinary curve. My first thought on seeing it, however, was this: Is not there too much shock when he leaves the 30-minute curve and enters the 4-degree curve? Would it not have been better to use, instead of a 30-minute curve, a 2-degree curve, *i. e.*, a curve of double the radius of the main curve? Would not the greatest shock to trains have been less?

Again, I found some years ago that it took some time to compute this curve complete for location, in the field. It required not so very many minutes at each curve, but then the time of a locating party in the West costs five dollars an hour. By Mr. Brown's method we have reduced the maximum shock to seven-eighths; by the plan last described we would have reduced it to one-half; and if we had used 50 ft. of a 1-degree curve, then 50 ft. of a 2-degree curve, then 50 ft. of a 3-degree curve, and so approached the main 4-degree curve, we should have reduced the maximum shock to one-fourth of that met had we used a 4-degree curve from P. C. to P. T. Now, I can use precisely this form of easement curve as approaches to all curves for Mr. Brown on 50 miles of located line in 10 per cent. more time spent in running in curves. And I will agree to find my P. C.'s and P. T.'s, each of them at each end of each easement, and reset all stakes on easements or main curve at any future time by knowing only the direction of the tangent back of the curve and the direction of the tangent beyond the curve. I will relocate these eased-off curves just as accurately and readily as Mr. Brown will relocate curves between these same tangents without easements. I have used these curves, and know what can be done.

The field computation is very easy. The explanatory figure, values of trigonometic lines and complete table of deflections up to easements for 10-degree curves I now have on one page of Butt's Field Book—same sized page as Henck. It would give me pleasure to show Mr. Brown or any one my method of doing this work or send any explanation in my power. The few copies of the little diagram and tables described which I now have are at the disposal of any one interested. It is my hope that another will find a better way.

The easiest riding road having sharp curves with which I am acquainted is the Lehigh Division of the Lehigh Valley Railroad. The maps show a compounding on curves sometimes at each 100 ft. The Chief Engineer told me that Mr. Sayre, in locating that portion of the road, which was done in an early day, used a compass. The compass was set up often in running in the curves, partly, perhaps, because a compass is set up easily, but mainly because it was seen the curves would ride easier. On a 10-degree curve, for example, there would be from the P. C. a station of 2-degrees, a station of 4-degrees, and so to main curve. This was common sense and good railroading. Transits came into use later, and as it took so much longer to set them up, the plan above fell into disuse. While an employé of the road, this was my understanding of the case. I began then to try and find a way to do with a transit, and for less expenditure of time, what Mr. Sayre did with a compass. I make, on level ground and a curve not too long, one extra set-up of the transit at each complete curve with easements. No offsets are used, but chord measurements and vernier deflections, and we chain from the transit as in any curve, and chain but once. The computation is exact. A careful thought of what an easement curve is will make it clear that its solution is merely trigonometric, and each distance and angle obtainable to any limit of accuracy.

WILLARD BEAHAN.

[Mr. Beahan's table of deflections and the explanations were published in the *Railroad Gazette*, May 31, 1889.—ED.]

Standard Rail Sections.

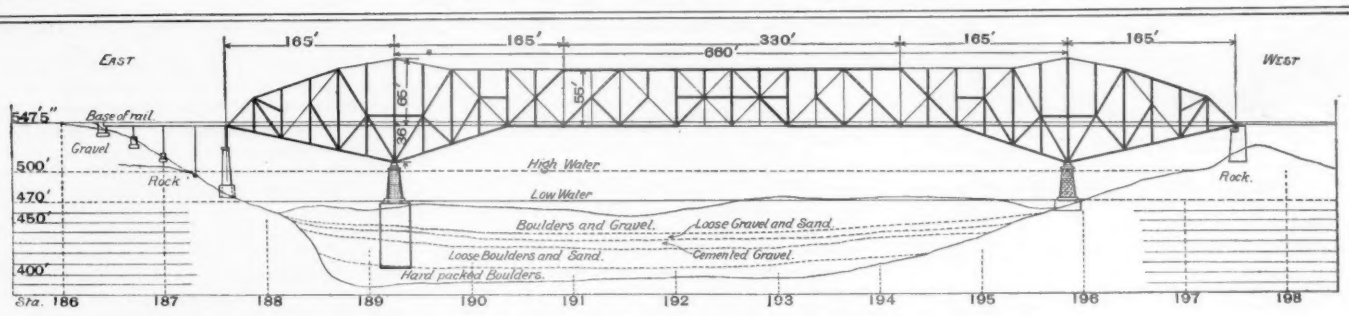
We have a considerable number of letters from railroad engineers on the matter of standard sections for rails, and find that most of them agree with the position taken in our editorial of April 11, viz., that the American Society's committee will probably do the most valuable work by collecting and disseminating information, rather than by attempting to formulate a set of standards at present. Several of the letters received are from members of the committee, but most of them prefer not to make any public expression of their opinions before any action is taken by the committee. We give below extracts from letters received, giving names only where we have express permission to use them:

A Member of the Committee: I am convinced that the best shape and distribution of weight in the different parts of the section cannot be evolved from theoretical consideration alone, but can only be determined after a careful study of results in a variety of circumstances. I think the principal work of the committee for some time to come should be to collect information. We have had a great abundance of opinion, but the store of well-observed and classified facts suitable for the purpose in view is small. The question of shape and weight of section should not be separated from that of quality of material. Each is a factor of the problem, just as for any tool, structure or piece of machinery. I believe the recommendation of standard sections by a committee of the Society to be open to objection, in view of the transformation now going on in weight of locomotives, etc. Our experience with the later rail sections has not been long enough to warrant the establishment of standards.

A Member of the Committee: In all matters of this kind the greatest deliberation and caution, even to the verge of timidity, are to be observed by those who would serve as reliable guides.

A Member of the Committee: I think the position taken in your editorial of the 11th is the correct one. The work to be done by the committee is largely one of selection and classification. To be valuable the report should be the consensus of a great mass of experience, opinion and observation. Recommendations of any set of standards would not be followed unless their excellence was clearly apparent, but the labors of the committee in collecting data from all available sources would be valuable, and would conduce to the best interests of the members of the Society and of the public. It would not be possible now to fix a set of sections that could be in the full sense standard, but the results of the labors of the committee, after a reasonable time, will indicate definitely what the standard should be.

A Member of the Committee: It would cheapen the production of steel rails to have a set of standard sections, and we are able to-day to produce a fairly good set of standards. They will not be perfect; they will probably



THE NEEDLES BRIDGE.—FIG. 1., PROFILE OF SITE AND GENERAL ELEVATION.

have to be changed; but I see no sound reason for delaying an effort to arrive at standard sections. The question of the rail involves that of the joint. I have no doubt there is yet much to be learned about the joint, but the angle-bar is giving pretty good satisfaction when it is rolled heavy enough.

A Member of the Committee: I would say positively that I coincide with your position. While the recent sections mentioned by you are probably right, common sense dictates that we should wait for some time for them to give the results of service. If these prove to be what we expect, controversy will cease. If, on the contrary, our expectations are not realized, by waiting we shall avoid putting ourselves in a false and ridiculous position. I do not think that the committee should sit down and do nothing, but, on the contrary, let them gather all the statistics possible, so that the results of service will be in shape for practical use.

A Member of the Committee: The more thought one gives this subject the more he feels the necessity of not going off half-cocked upon it. The resolution is not broad enough to cover the whole question. The form of wheel, the joints, tie-plates and the tie should be considered. We should not attempt to formulate standards until after results have been collected of the service rendered by some recent forms and from others that may be suggested. I believe that a report fixing now a set of standards would be mighty interesting reading after the lapse of a decade, but not very creditable to the committee.

S. M. Felton, Jr., First Vice-President, New York, Lake Erie & Western, Member of the Committee: I believe we have enough experience to-day to justify a recommendation by the society of a uniform set of rail sections. Manufacturers have had enough experience to give intelligent advice, and the railroads have used steel rails of various sections and weights long enough to reach an intelligent conclusion. The only change now in order is the increase in the weight of the rail. All sensible men will regard some uniform standard as much better than the very great diversity in sections existing to-day, and will sink some of their individual views in order to secure uniformity. It would materially lessen the cost of production, and would enable manufacturers to keep in stock rails which could be promptly furnished to fill pressing orders, as, for instance, for frogs, switches and crossings. I am a strong advocate of uniform sections, and of sinking once for all the individuality in rail sections which has become a burden and an expense to the railroads of this country.

H. S. Haines General Manager, Plant System: Accepted definitions prevent unnecessary discussion, and to this end the term standard rail sections should be acceptably defined. Does it mean similar contour lines and uniform gradation of weight of section per yard? I will assume that this is what is meant, and ask what purpose is sought in the establishment of such uniform sections? Is it to make rails cheaper, or more suitable for the purposes for which they are intended? I can understand that it would be an advantage to rail-makers to keep their mills going on stock while orders were scarce. The general adoption of sections, increasing by 5 or 10 lbs. per yard from 40 up to 90 lbs. would enable them to keep a salable stock on hand. I think it practicable to agree upon two or three types of each gradation of weight, with such an approach to unanimity as would encourage manufacturers to keep on hand a stock at a certain price per ton below their price for rolling rails of other sections. This would be an incentive to the recognition of standard sections. There might be as many types as would satisfy the two or three ideas which have appeared to prevail in the discussions on this point. If certain dimensions for each weight of section can be recognized by the champions of each idea as common among themselves, the matter of standard rail sections would have been disposed of so far as is practicable with the existing differences of opinion, and as far as seems advisable with our present information.

A Railroad Engineer, a specialist in rails: I am inclined to agree with you that it would be hazardous to decide immediately, or within the next six months, on a set of standard rail sections, but I do not think that the Society should let the subject drop. The work done by the earlier committee was creditable and important, and I think that your suggestion that they should publish progress reports is an excellent one. At the end of two years they could very likely formulate more intelligent recommendations than at present, and recommendations made then would certainly be listened to with more care than now. A question which should be decided, first of all, is that of standard drilling for splice bars. The argument that rail makers could roll, in dull seasons, rails of standard sections and carry stock, counts for nothing until some standard drilling is adopted, because economy in handling requires that the rail should be drilled immediately after it is finished. There are standard sections to-day taken by a good many different roads, but this benefits the rolling mills very little, because each road has its own ideas as to the location of the bolt holes, their number, etc. Therefore, while the American Society's committee is waiting for further results from what you call "balanced" rail sections, they could put in their time very profitably in getting together data as to the present practice for drilling rails and making a recommendation as to what seems the best practice. It seems to me that there is such strong argument in favor of certain principles, that the committee could clearly make an intelligent recommendation for standard drilling. There are at present as many different styles of drilling as there are rail sections.

W. R. Stirling, First Vice-President, Illinois Steel Co.: The subject matter is important, but I have not been able to give it sufficient time to be able to express an opinion of value. From a commercial standpoint, it is self-evident that if the railroads were able to agree upon standard sections, it would reduce the cost of manufacture and increase the facilities of the mills.

E. S. Moffat, General Superintendent Lackawanna Iron & Steel Works: It is immensely desirable for the mills, as well as for the railroads, that a set of standard sections should be soon established which will give the best possible results for the amount of material employed. The mills have suffered much abuse for the poor service of some of the badly designed rails which they have been obliged to make, and will hail the day when the ideal standard section may be firmly established. Our own recent studies and investigations lead us to think that in the main the Dudley-Hawks-Hunt principles of design are correct. Granting this, it will still take the test of service to establish the best proportions of head, web and flange for the different weights of rail, the proper curves for the corners of the head, and other details of design, concerning which there is still considerable difference of opinion among practical railroad men. I am therefore inclined to agree with you that the experience with these sections has been perhaps too limited to justify formulating yet a set of standards.

William H. Brown, Chief Engineer, Pennsylvania Railroad: It will do no harm to have the matter agitated, but the railroad companies who pay the money for the rails are very apt to decide the question for themselves. Some years ago we made a change in our rail section which was based entirely on theory, and we have been obliged to abandon that section and go back to our old sections, which have stood the test of trial. We think our sections suit our traffic better than anything else in market to-day. The only change that I would ask would be to make our sections heavier than they are at present.

The 660-Foot Cantilever Bridge at the Needles, California.

(WITH AN INSET SUPPLEMENT.)

The new bridge of the Atlantic & Pacific Railroad over the Colorado River at the Needles, Cal., will be, on completion, the longest single span of the cantilever type in the United States, and will only be exceeded in length of trussed span by the Forth bridge in Scotland and the Sukkur bridge in India. It will take second place in the United States only when the Memphis bridge is completed.

The necessity for a new bridge at this point was occasioned by the great difficulty found in maintaining the present crossing. The Colorado River is subject to great changes in the volume of its flow, and at the Needles the current is extremely rapid, scouring the sandy river bottom to great depths, and frequently changing the position of the main channels. The old bridge consists of fourteen 80-ft. spans, a draw span of 172 ft. and a trestle approach, all of wood, resting on pile foundations. On several occasions the spring floods have washed out portions of the bridge and approaches, and, moreover, the position of the main channel has changed at times sufficiently to render the draw useless at low stages of water. As the river is navigable to light-draught steamers for 100 miles above the Needles, the bridge at such times constitutes an obstruction to navigation.

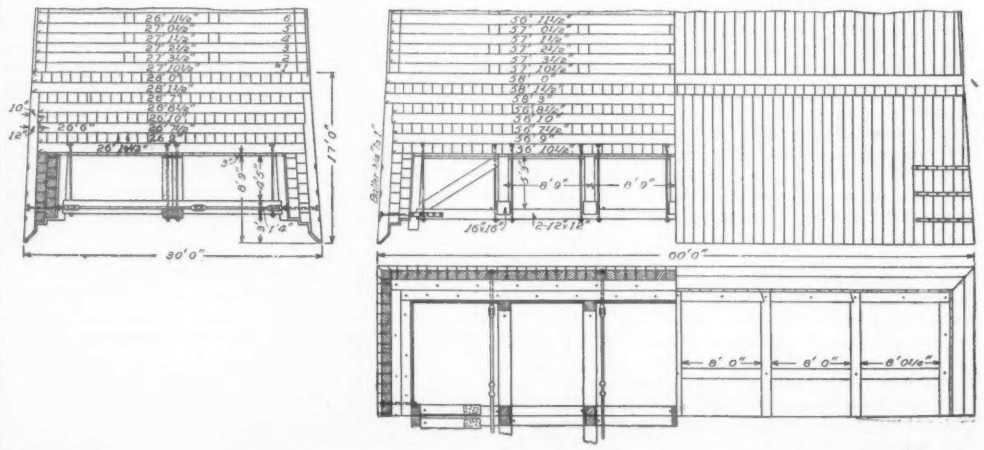
The site chosen for the new bridge is 9½ miles down the river, at a point where the character of the banks enables a high grade crossing to be made without expensive approaches. This change in the location and elevation of the crossing has necessitated important changes in the alignment of the road. In all, 13 miles of new road have been built, and the total length of the road increased by three miles. The general character of the river banks at the site is well shown by the accompanying engraving (fig. 3, inset), which is from a photograph taken from the Arizona, or east, shore.

The bridge, as now being erected, consists of a short approach viaduct, two 330-ft. cantilevers and an intermediate suspended span of 330 ft., making the clear span between centres of main piers 660 ft., and between centres of anchor piers 990. (See fig. 1.) Compared with recent bridges, other than suspension bridges, the Needles bridge stands third in length of clear span.

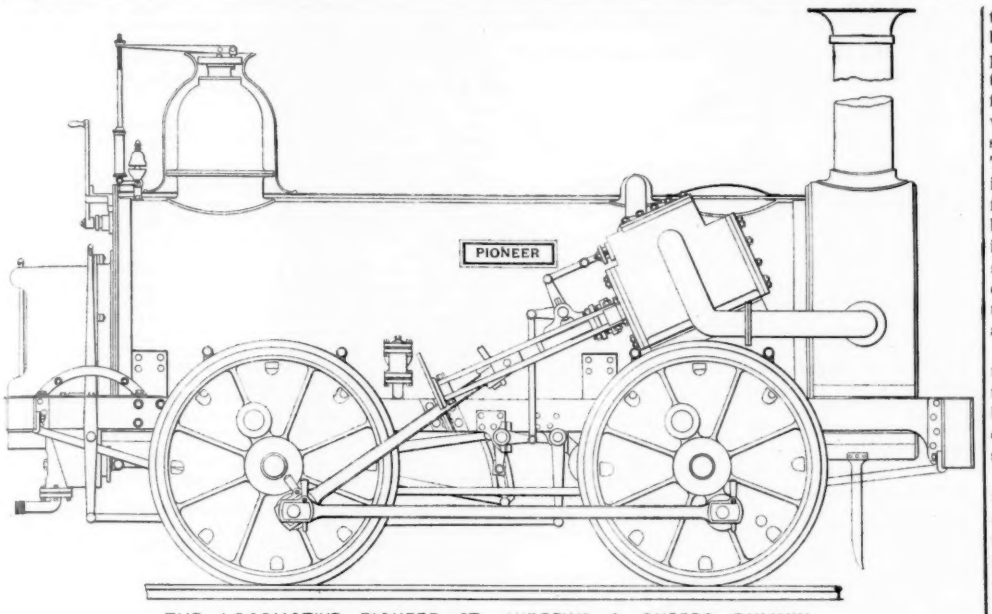
The foundations called for by the design were: (1) A wing wall abutment and a number of small pedestals for the viaduct approach; (2) two concrete anchor piers for the shore ends of the cantilevers, and (3) two main piers of masonry. The east main pier was sunk by the pneumatic process to a depth of 61 ft. All the other piers were built up from the solid rock, which was at or near the surface of the ground.

Work was begun by the contractors for the substructure in the fall of 1888, on the west, or California, bank of the river. All the machinery had to be hauled from the railroad tracks at Powell, a distance of three miles. During the following winter and spring the main and anchor piers on the west side of the river were completed, a pile trestle was built to the site of the east main pier, and some preliminary work was done on the east side of the river. No work was done during the summer on account of the extreme heat. In the winter of 1889 and '90 all the piers on the east side were built, the entire substructure being completed on the 21st of February, 1890. In building the foundation several peculiar conditions were presented, as described in detail hereafter.

The west main pier (see general elevation, fig. 1) was located at low-water mark, at which point the bed-rock is exposed. The necessary foundation was secured by



THE NEEDLES BRIDGE.—FIG. 2, DETAILS OF CAISSON.



THE LOCOMOTIVE PIONEER—ST. ANDREWS & QUEBEC RAILWAY.

excavating from 2 to 4 feet into the rock, the bottom of the excavation being stepped off, following the slope of the rock, a simple puddled crib sufficing to keep the water out. The entire excavation and the crib were then filled in with concrete to low-water level, above which the pier was carried up in masonry. The pier was rectangular in plan, with a semi-circular starling on the up stream side. The principal dimensions are given in the following table:

running across the pier. These tie-joists were built in with the concrete. The coping and the vertical shafts for the anchor bars were outlined in the same way. Finally, the timber walls were removed, the ends of the tie-joist dug out, the resulting holes filled with mortar, and the entire surface was then plastered with cement.

The foundations for the east main pier presented the first real difficulty. The bed rock at this point is overlaid with 80 ft. of sand, gravel and boulders. The upper

TABLE OF PRINCIPAL DIMENSIONS OF PIERS, NEEDLES BRIDGE.

Name of Pier.	Coping.	Batired Section.	Footing Courses.	Total Ht. including pedestals.
East Anchor	9′ 6″×34′ 6″×2′	Top=9′×34′ / Bot.=12′ 4″×37′ 4″ } ×40′	15′ 4″×40′ 4″×11″	53′
East Main above concrete base	11′ 0″×42′ 6″×2′	Top=10′ 0″×41′ 6″ / Bot.=16.48×47.34 } ×31.1′	Top=49.34×18.48 / Bot.=53.34×22.48 } ×6′	41′.60
West Main above concrete base	11′×42′ 6″×2′	Top=10′ 0″×41′ 6″ / Bot.=15.46×46.38 } ×26.25	17.40×48.38×2.0	32′.75
West Anchor	15′ 6″×39′ 6″×2′	Top=15′ 0″×39′ 0″ / Bot. stepped off. } avg. ht. 15′ 0″	17′ 6″×43′ 0″×15′	32′3

Batir ½″ to the foot, except on semicircular starlings, which had a curved profile.

The stone used throughout the work was a bright red sandstone of excellent quality, obtained from quarries in Arizona, 140 miles east of the Needles, on the line of the Atlantic & Pacific. The general appearance of the piers and quality of the masonry can be best described by reference to fig. 4 (insert), which is engraved from a photograph of the east main pier. The two main piers were essentially the same above the footing course. In laying the backing courses the blocks were separated so as to leave a clear space of two or three inches around each block. These spaces were filled with concrete well rammed into all interstices.

Both anchor piers were built entirely of concrete. Their foundations were in excavations cut out of the solid rock, as in the case of the west main pier. The footing of the east pier was just above low-water level, while the west pier was entirely above high-water mark.

The anchor piers were designed so as to allow the entire weight of the monolith of concrete to act on the anchor bars before putting any part of it in tensile strain. This was carried out as follows: After the pier had been carried up about 2 ft., two plate girders, 4 ft. deep and about equal in length to the length of the pier, were put in position parallel to each other and to the sides of the pier, so as to divide the horizontal cross section of the pier into three near equal areas.

Smaller girders extending across the pier were then bolted to the upper flanges of the longitudinal girders. These cross-girders were spaced about 2 ft. 6 ins. between centres, and together with the longitudinal girders so sub-divided the base of the pier as to leave no large area unsupported. The anchor-bars were connected with this system of girders by pins passing through the lower ends of the anchor bars, and through short, heavy cross girders or bearings placed underneath the longitudinal girders and bearing against their lower flanges. This connection was not made, nor were the anchor bars put in position until after the completion of the piers, vertical shafts being left in the body of pier for this purpose. When the girders were in position as described, the pier was carried up around them, completely inclosing the whole system, except where temporary openings were left to enable the connection with the anchor bars to be made.

The concrete was deposited in layers of 9 in. thickness. It was confined horizontally to the required dimensions and batir by walls of plank supported on an external frame of joist. This framework was carried up in sections as the pier was built, 5 ft. being added at a time. The top of each section was braced at intervals by joists

layers contain boulders of a large size, but alternating with layers of sand, so that no satisfactory foundation is found until reaching a depth of 60 ft. below low water. The bed of the river at the pier site was only 12 in. under water. It was decided to be impracticable to build a caisson on shore and float it into position, so the following method was employed: A crib of timber was built, completely inclosing the site of the pier, and of such dimensions as to give 5 ft. space between the crib and the walls of the caisson. The crib and the inclosed area were then filled in with earth until the level of the whole was 2 ft. above the river. Sheet piling was driven all around the crib to guard against scour, and piles were driven on the up-stream end, forming a wedge-shaped protection against drift or steamers. On this protection a platform was built, on which the cement mixer was put in position. The railroad trestle was extended to this platform and stone was delivered direct from the cars to the mixer. A second platform was built for the hoisting engine and derrick, and a flat-bottomed barge was fitted up with three air compressors and the necessary boilers. (See fig. 3, inset). The caisson was then built in position on the made ground, the shoe resting on blocking ready for sinking. The blocks were undermined until the shoe rested on the ground, when the blocks were withdrawn with the aid of a water jet. The details of the caisson, which was designed by Sooysmith & Co., the contractors for the substructure, are shown in fig. 2. It was built of Oregon pine, chiefly of 12 × 12 in. sticks. There were two excavating shafts, one supply shaft and one main shaft.

Sinking was begun Nov. 21, 1889, and progressed slowly, owing to the exceptionally difficult nature of the material. The average rate of sinking was 10¼ in. per day, which was very rapid work considering the large percentage of boulders and other material that had to be taken out through the excavating locks. The caisson kept plumb, and in position and contrary to expectations the crib surrounding the site was not disturbed. At 61 ft. below low water a layer of large, closely packed boulders was reached. The shoe of the caisson was then 20 ft. above bed-rock, and as the boulders gave a satisfactory foundation it was not considered necessary to go further. The working chamber was then filled in with concrete and the air pressure taken off on Feb. 5, after having been maintained for 74 days. The pier was completed on Feb. 21, and was found to be in position and plumb within one inch.

The concrete used throughout the work was made of English Portland cement. The broken stone used on the west piers was chiefly sandstone and granite, broken by hand. The stone used on the east side was composed of fragments of rock varying in size from a piece the size of a marble to a 4-in. cube. This stone was found on the surface of the surrounding country, and was raked up into rows, screened, loaded into cars and sent to the mixer without other preparation. The concrete used in filling the crib and working chamber of the east main pier was proportioned as follows: 1 part English Portland, 3 parts sand, 4 parts broken stone. For the anchor piers and masonry backing 2½ parts of sand were used. The percentage of stone in the anchor piers was increased by imbedding one-man stones in the layers of concrete. Care was taken that a space of at least 2 in. should be left around each stone to be filled in with concrete.

The superstructure is now being rapidly put into position. Figs. 5 and 6 (inset) illustrate the commencement of the work. The traveler shown in fig. 6 is of interest as being one of the largest and most completely equipped ever built. It has arrangements for handling 18 ropes simultaneously.

The bridge is being erected under the supervision of S. M. Rose, Chief Engineer of the Atlantic & Pacific, and Mr. W. F. Behrens, C. E., Resident Engineer. The superstructure was let to the Phœnix Bridge Co., the piers and foundations being built by Sooysmith & Co., under the efficient management of Mr. Geo. Adgate, Superintendent.

The Locomotive "Pioneer."

We have received from Mr. G. A. Haggerty, Mechanical Superintendent New Brunswick Railway, a blue print of the Pioneer, the first locomotive introduced on the St. Andrews & Quebec Railway. The St. Andrews & Quebec was the first railroad chartered in Canada and is now a part of the New Brunswick Railway. The Pioneer was built by Robert Stephenson & Co., Newcastle-on-Tyne. The blue print sent us was made from a copy by Mr. A. E. Bartlett, from the original drawing executed by Mr. Edward A. Starbuck, of London, February, 1850. This drawing was presented to Mr. Haggerty by Mr. Henry Osborne, of London, who was formerly Manager of the St. Andrews & Quebec Railway. For a number of years this engine ran between St. Andrews and Dumbarton on 45-lb. U-rails, laid on longitudinal stringers. The engine has long since gone to the scrap heap.

Some of the Carnegie Works.

In order to make their product better known to railroad men, or at least to make it known to more railroad men, Messrs. Carnegie, Phipps & Co. from time to time invite parties of them to visit their works. The latest of these excursions was made last Friday. A party of mechanical officers, representing many of the railroads of the New England and Middle States, went from New York and Philadelphia by special cars attached to the Western express, Pennsylvania road, on Thursday night. They visited the Homestead and Edgar Thomson works and were entertained at luncheon at Homestead and at dinner at the Duquense Club, Pittsburgh, and left Pittsburgh for the East at 8.10 p. m. Friday. The officers of the Carnegie companies did everything to made the excursion agreeable and instructive.

The first visit was to the Homestead Works. These works are on the bank of the Monongahela River, nine miles above Pittsburgh, and occupy about 50 acres of ground, having a river frontage of 3,100 ft. The entire property comprises 89 acres. The works comprise the Bessemer department, the open-hearth steel department, a slabbing mill, a plate mill and structural mills for rolling steel beams, channels, etc. The output of the works is about 13,000 tons per month, consisting of slabs which are rolled into plates at the works and are also shipped to other plate mills, of spring steel, rods and various merchant shapes, and of various bridge material. Steel I-beams 24 in. deep are now being rolled at these mills.

The open-hearth department, which now contains eight furnaces, is being duplicated by a new plant, which will be in operation in about two months. The drawings for this additional plant were begun last January. The total outlay for it will be about $700,000. The machinery will be of the highest class, and automatic as far as it is possible to make it. Nearly all of the cranes and automatic machinery have been designed and, to a large extent, built at the Homestead Works.

The present open-hearth department comprises a main building 86 × 501 ft., with a 45-ft. lean-to on each side, an inspecting and marking-out department 42 × 273 ft., and a shearing department 86 × 187 ft. The new building will be about 200 × 400. In this department there is a very accurate system of inspection and record by which the numbers of the melts and ingots are carried through to the finished plates, enabling a complete indentification to be made of any individual plate. The slabbing mill is universal, with vertical rolls 20 in. in diameter, driven at 50 revolutions per minute by a pair of 30 × 54 reversing engines. The horizontal rolls are 33 in. in diameter, driven by a pair of 40 × 54 reversing engines. In this slabbing train ingots of 25 tons, 48 × 54 in., may be handled. Such ingots

are rolled to a section 3 × 11 in. The shear power is hydraulic, and operated by the descent of the upper knife with a pressure of 4,000 lbs. per square inch. The shear is capable of cutting a 24 × 48 section. A general hydraulic pressure of 500 lbs. per square inch is carried in the piping throughout the mill. The plate slabs from this mill, after being worked down from square ingots to a thickness of, say, 3 in., are reheated and then rolled into plates in the usual way, giving the plates more than the usual amount of work.

The plate mill is three-high, the top and bottom rolls being 32 in. diameter × 192 in. long, and a middle roll 22 in. diameter × 192 in. The roll train is driven by a 42 × 54 horizontal engine. The roller table is 363 ft. long, with an overhead traveling crane running the full length of it. On this table the plates are cooled, inspected and stamped. Thence they run to the shears, of which there are three, one with a knife 135 in. long. The three shears were originally put in with the idea of shearing one side of the plate on one shear and then passing it into the next for shearing the other side. In practice, however, it is found handier to turn the plate end for end and shear both sides with one machine. Therefore the third is not used. Plates weighing as much as six tons can be handled in this mill. A good deal of work is now being done on plates for the government both for marine boilers and for armor. The specifications and requirements for these plates are very strict, and they are subjected to constant inspection by a corps of government inspectors, who are in the mills at all times.

The arrangement of cranes for handling material at the furnaces, in the mills and for shipping is very complete and convenient. One of the neatest labor-saving devices noticed was a traveling crane for loading I-beams and heavy structural material on to the cars. There is a depressed track running into the yard having standing room for seven cars. Over this runs a locomotive crane of 10,000 lbs. capacity, the jib of which sweeps through a complete circle, and by which material can be picked up from any position within its reach and placed on the car below it. This arrangement, as well as the design of many of the features of the new plant, is due to Mr. Potter, the General Superintendent of the works.

From the Homestead Works the party went to the Edgar Thomson Works. Unfortunately, so much time had been consumed at the Homestead that but a very hasty examination of these works could be made. They are now making about 30,000 tons of rails per month, and employing 3,600 men. The ingot capacity of the works is about 1,500 tons a day. At the Homestead Works about 2,600 men are employed.

Wooden Trestle Bridges.*

BY WOLCOTT C. FOSTER.

STANDARD TRESTLE PLANS OREGON & WASHINGTON TERRITORY RAILROAD.

The illustrations show the standard trestle plans of the Oregon & Washington Territory Railroad for trestles of two decks and over, as designed and built by Mr. Frank Riffle, Chief Engineer of the road.

These trestles belong to that class in which the structure is divided into decks, each deck being separated from those above and below by purlins. The framing of each deck is entirely distinct and separate from any other part of the structure, thus requiring timber of but moderate length. The purlins are gained on both upper and lower sides ½ in. to receive the caps and sills of the various decks, and the caps and sills are each gained the same amount to receive the purlins. The decks are divided into two stories each by the sway and longitudinal bracing.

Attention may be called to the counter posts introduced in all the decks below the top. Instead of the batter of the counters being in the same direction as that of the outside of batter posts, as in some cases, examples of which will be given later on, it is in the opposite direction. While the batter of the outside posts is 3 in. to the foot throughout the entire structure, that of the counters varies with the deck in which they are located. There are no vertical posts in the trestle. Those which in common practice are placed plumb, in this design have an outward batter of ½ in. per foot.

The absence of all mortise and tenon work is to be noted, thus doing away with much costly carpenter work. The posts are held in place by a ½-in. gain and 1 in. × 6 in. dowels.

When the sills become so long that it is inconvenient to obtain timber of sufficient length, two pieces are joined together. The form of joint is shown in the enlarged detail. It requires eight ¾-in. × 23-in. bolts, which are not staggered, but are placed in pairs.

The floor is fastened directly to the caps by bolts passing through the outside guard rails, ties, jack stringers and caps. In addition to these bolts blocks holding the stringers in place are spiked to the caps by 60d spikes. The ties are spaced six inches apart.

This class of trestle is said to be very economical in construction on account of requiring timber of but moderate length, and ease of both original erection and repair. The special design shown has much to recommend it and is an excellent example of this type or class of structure.

Following is a list of the sizes of the timber employed as well as of the iron work.

BILL OF TIMBER.

Name.	Size.
Floor system:	
Outside guard rails	10 x 12 in. x 17 ft.
Intermediate guard rails	5 x 8 in.
Ties	6 x 8 in. x 16 ft.
Jack stringers	7 x 16 in. x 32 ft.
Track stringers	9 x 16 in. x 32 ft.
Top deck:	
Posts	12 x 12 in.
Sway bracing (upper)	4 x 10 in. x 24 ft.
" (horizontal)	4 x 10 in. x 22 ft.
" (lower)	4 x 10 in. x 30 ft.
Cap	12 x 14 in. x 16 ft.
Sill	12 x 14 in. x 30 ft.
Longitudinal bracing (diagonal and horizontal)	6 x 10 in.
Purlins	12 x 12 in. x 18 ft.
Second deck:	
Posts (including counter posts)	12 x 12 in.
Sway bracing (upper)	4 x 10 in. x 26 ft. right. 4 x 10 in. x 28 ft. left.
" (horizontal)	4 x 10 in. x 38 ft.
" (lower)	4 x 10 in. x 31 ft. right. 4 x 10 in. x 33 ft. left.
Cap	12 x 14 in. x 30 ft.
Sill	12 x 14 in. x 47 ft.
Longitudinal bracing	6 x 10 in.
Purlins	12 x 12 in. x 18 ft.
Lower deck:	
Posts	12 x 12 in.
Sway bracing (upper)	4 x 10 in. x 34 ft. right. 4 x 10 in. x 36 ft. left.
" (horizontal)	4-4 x 10 in. x 27 ft.
" " splice	12 x 12 in. x 2 ft.
" (lower)	4 x 10 in. x 40 ft. right. 4 x 10 in. x 42 ft. left.
Cap	12 x 14 in. x 47 ft.
Sill	2-12 x 14 in. x 33 ft.
Sill (splice)	2-4 x 12 in. x 6 ft.
Longitudinal bracing	6 x 10 in.

DESCRIPTION OF IRON WORK.

Name.	Size.	Use.
Bolts	¾ x 50½ in.	Floor system to caps.
	¾ x 41 in	Sills to caps of different decks.
	¾ x 37 in	Outside guards to jack stringers.
	¾ x 27 in.	Longitudinal bracing.
	¾ x 24¾ in.	Longitudinal bracing.
	¾ x 23 in	Sway brace splice, sill splice, horizontal sway bracing to posts.
	¾ x 22 in	Packing bolts.
	¾ x 19 in	Sway bracing.
	⅝ x 11 in	Intermediate guard rails to ties.
Drift bolts	¾ x 24 in	Sill to piles.
Dowels	1 x 6 in	Posts to caps and sills.
Spikes, cut	60d	Stretchers to caps.
" boat	½ x 9 in.	Sway braces to posts.

Train Accidents in March.

COLLISIONS.

REAR.

1st, on Richmond & Danville, near Suwanee, Ga., a freight train broke in two and the rear portion was run into by a following freight. Engine, caboose and four cars wrecked.

2d, on Richmond & Danville, near King's Mountain, N. C., a construction train ran into the rear of a freight, wrecking locomotive and seven cars. The wreck caught fire and was partially destroyed. Ten laborers injured.

3d, on Pittsburgh, Fort Wayne & Chicago, at Lakeville, O., a freight train which had been disabled and stopped was run into by a following freight, which disregarded the danger signal exhibited by the standing train, making a very bad wreck. A tank car containing gasoline, in front of the caboose of the first train, was exploded by the shock, and the wreck, being immediately enveloped in flames, was burnt up. Three trainmen killed.

4th, on Central of Georgia, near Gordon, Ga., a freight train stalled on a grade was run into by a following freight. Engine, caboose and a number of cars badly wrecked. One trainman killed, another injured.

5th, on Chicago & Northwestern, at Fort Atkinson, Wis., a freight train standing on the main track was run into at the rear by a special train, disabling an engine and doing other damage.

5th, on Charlotte, Columbia & Augusta, near Pineville, N. C., a freight train broke in two on a descending grade, and the rear portion ran into the forward one, wrecking 15 cars. Three trainmen injured.

6th, about 9 p. m., on the Lake Shore & Michigan Southern, at Bay View, N. Y., eastbound passenger train No. 12, running about 38 miles an hour, on a grade descending 16 ft. per mile, broke in two behind the sixth car, leaving 5 cars, the rear portion, uncontrolled, the air brakes being not connected, and a single brakeman being in the rear car. The train ran in this condition 2¼ miles, when the forward portion was stopped by the application of the automatic brakes from one of the passenger cars. The rear portion, which at one time was about half a mile or more behind the other, came on at considerable speed and collided with the other, wrecking two cars. Six passengers were killed and 17 injured. There were no fires in the cars, but the wreck was ignited in one place by a lamp. This was, however, soon extinguished by a porter. The train broke in two at Dunkirk, by reason of the failure of a defective lock in a Cowell coupler, but was recoupled by a brakeman, who thought the fastening seemed all right. At this breakage the air-brake hose pulled off, the steam-heating coupling was disabled and the safety chains broke. The conductor, on discovering that the train had broken in two just before reaching Bay View, went to the rear end of the forward portion, and, looking back and seeing no trace of the rear portion, pulled the bell rope as the signal to stop. The engineer, however, says that, although the bell gave a single stroke at two different times, he heard no signal to stop, and that he had not shut off steam when the brake was applied from some car in the train. The investigations have elicited no evidence as to who applied the brake. The conductor and engineer were discharged, the latter for running with a train not properly under his control for the purposes of an emergency stop.

7th, on Milwaukee, Lake Shore & Western, near Cato, Wis., freight train ran into the rear of another freight during a dense fog.

7th, on New York Central & Hudson River, at Palmyra, N. Y., the caboose attached to a locomotive standing at a water tank was run into by a locomotive and thrown over so as partially to obstruct an adjoining main track in front of a westbound passenger train. All the steps on one side of the passenger cars were torn off and one coach was badly damaged.

8th, on Grand Rapids & Indiana, at Stanwood, Mich., a freight train ran into the rear of a preceding freight, doing some damage.

10th, on Burlington & Missouri River, near Harvard, Neb., a freight train ran into the rear of another freight, wrecking engine, caboose and eight cars. Two trainmen asleep in the caboose were killed. The wreck caught fire and was destroyed. A dense fog prevailed at the time.

11th, on Chicago, Rock Island & Pacific, near Blue Island, Ill., passenger train ran into the rear of a freight train, damaging engine, caboose and three cars. One trainman killed and another injured, and several passengers slightly bruised.

13th, on Fall Brook Coal Co.'s road, near Ramsey's, Pa., a freight train ran into the rear of a preceding freight, derailing the engine and several cars.

16th, on Burlington & Missouri River, near Inland, Neb., a disabled freight was run into at the rear by another freight, wrecking an engine and 16 cars. Two trainmen killed.

17th, on Boston & Maine, near South Merrimac, N. H., a freight train broke in two and the detached portions collided, wrecking four cars.

18th, on Pittsburgh, McKeesport & Youghiogheny, near Rankin, Pa., a freight train ran over a misplaced switch and into some freight cars standing on a siding, doing considerable damage. Two trainmen injured.

19th, on Ohio & Northwestern, in Cincinnati, O., rear car of a switching freight broke loose on a grade and, the brakes being inoperative, ran back down grade and into the head of a freight standing on the main track. Brakeman injured.

20th, on Norfolk & Western, near Shawsville, Va., a freight train ran into the rear of another freight in a tunnel, wrecking five cars.

20th, on Texas & Pacific, near Bonham, Tex., a freight train broke in two and the rear portion ran back and collided with a following freight. Engine, caboose and three cars damaged.

20th, on New York, Ontario & Western, at Rockland, N. Y., a fast freight train separated and the two portions collided, wrecking a number of cars and demolishing a station building. Brakeman killed, telegraph operator injured.

21st, on Pennsylvania, near Greensburg, Pa., freight train ran into the rear of another freight, doing some damage and injuring a fireman.

21st, on Pennsylvania, at Loyalhanna, Pa., a fast freight train ran over a misplaced switch and into some box cars standing on a side track. Engine and 10 cars wrecked.

22d, on Pittsburgh, Cincinnati & St. Louis, near Columbus, O., a passenger train ran into the rear portion of a freight train which had been cut in two for the purpose of ascending a grade in sections.

22d, on Pennsylvania road, at Johnstown, Pa., freight train ran into the rear of another freight.

22d, on Old Colony road, at Concord Junction, Mass., a freight train standing in the yard was run into by another freight, wrecking engine, caboose and a number of cars. The wreck caught fire and was partially consumed. Three trainmen injured.

23d, on Pennsylvania, near Bristol, Pa., passenger train ran into the rear of a freight train, wrecking the caboose and several cars of the latter and derailing the passenger train. Engineer and fireman injured. An operator's mistake in signaling is given as the cause.

24th, on Louisville & Nashville, in Nashville, Tenn., a northbound passenger train ran over a misplaced switch and into some freight cars standing on a siding, driving one car through the brick wall of a station building. Two men engaged in unloading cars were killed and two injured.

24th, on Delaware & Hudson Canal Co.'s road, near Howe's Cave, N. Y., a passenger train ran into the rear of a freight train, wrecking several cars.

24th, on Alabama Great Southern, near Fort Payne, Ala., a freight train descending a very steep grade became uncontrollable by reason of wet clay which had been washed down upon the road and which lubricated the track and brakes. After running a quarter of a mile at considerable speed it collided with some flat cars, wrecking a number of them and the locomotive. Five trainmen injured.

24th, on International & Great Northern, at Jewett, Tex., a freight train broke in two and the engine was detached from the forward portion to flag a train which it was to meet at the next station. The cars were not controlled and ran down grade into the locomotive, doing some damage.

25th, on Old Colony road, near Fayville, Mass., freight train ran into the rear of a preceding freight. A number of cars were wercked, caught fire, and were consumed.

26th, on Ohio River road, at Wheeling, W. Va., a freight train ran over a misplaced switch and collided with an engine standing on a siding, damaging both engines and several cars.

26th, on East Tennessee, Virginia & Georgia, near Sweetwater, Tenn., a freight train broke in two and the two portions collided, injuring two trainmen.

26th, on Pennsylvania, near Lilly, Pa., a freight train ran into the rear of another freight, wrecking the engine and five cars.

28th, on New York Central & Hudson River, near Waterloo, N. Y., a freight train ran into the rear of a preceding freight, damaging engine, caboose and three cars.

28th, on Northern Pacific, at Hall, Mont., a freight train ran into the rear of another freight, the engine of which had been detached and run into a water tank. Caboose and several cars wrecked. A passenger standing on the rear platform of the caboose was killed.

30th, on East Tennessee, Virginia & Georgia, near Sweetwater, Tenn., a freight train broke in two and the rear portion was run into by a following freight at a curve. Fireman killed, engineer hurt.

31st, on Rio Grande Western, at Akron, Col., freight train ran into the rear of a preceding freight. Trainman injured.

BUTTING.

5th, on Milwaukee Northern, near Kiel, Wis., a butting collision between two heavy freights wrecked both engines and about 20 cars.

7th, on Boston & Maine, near Grafton Centre, N. H., butting collision between two freights, wrecking the forward portion of both.

7th, on Birmingham, Sheffield & Tennessee River, near

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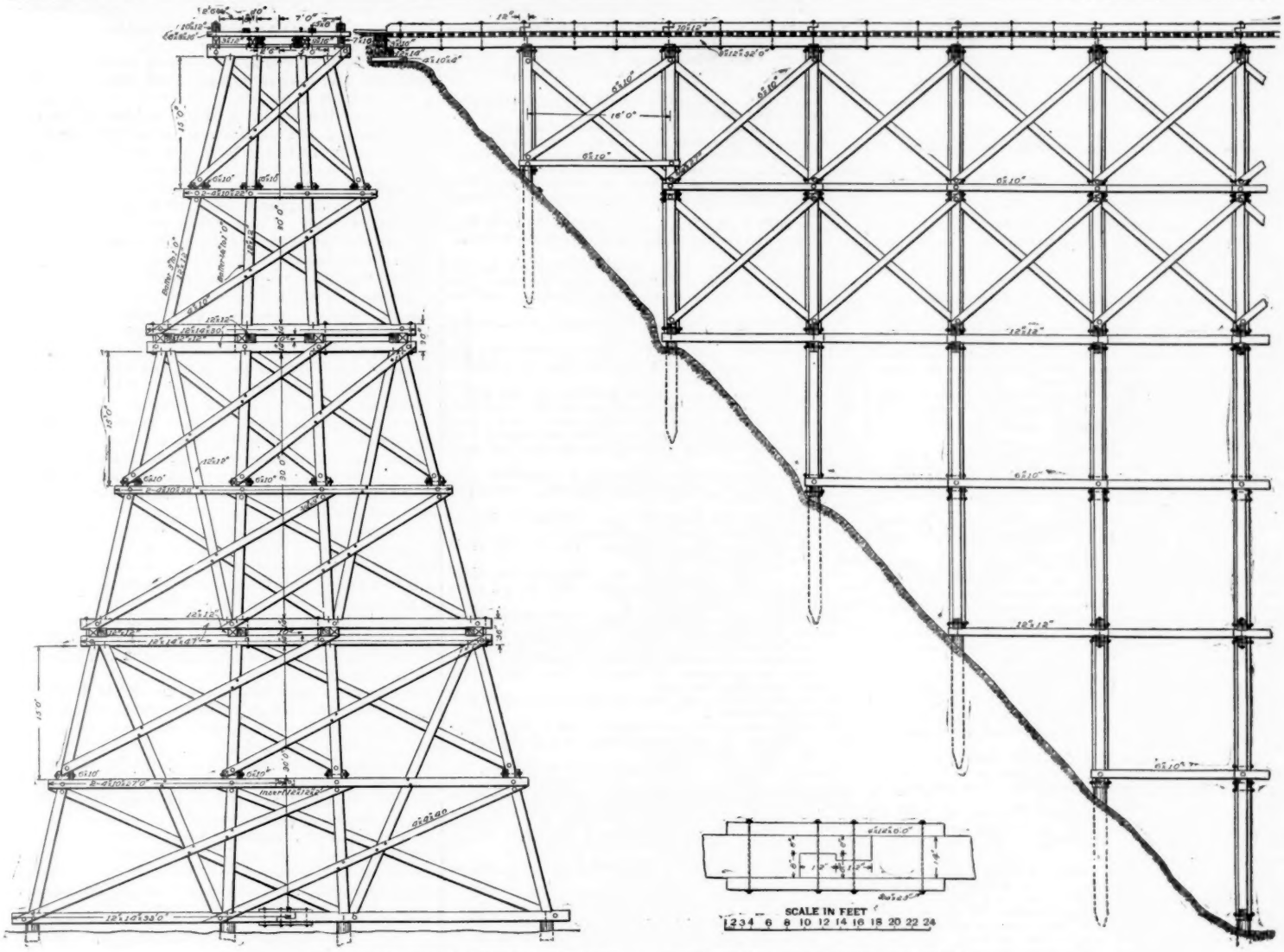


STANDARD HIGH TRESTLE—OREGON & WASHINGTON TERRITORY RAILROAD

MR. FRANK RIFFLE, CHIEF ENGINEER.

Isbell, Ala., butting collision between passenger and freight trains.

13th, on Chicago, Milwaukee & St. Paul, at Mt. Carroll, Ill., butting collision between two freights. The cars of the eastbound train broke loose from the tender and started back down grade, colliding with a following freight. Three engines and 21 cars wrecked.

15th, on Delaware & Hudson Canal Co.'s road, at Saratoga, N. Y., butting collision between passenger and freight trains, due to a misplaced switch.

19th, on Northern Central, at Trout Run, Pa., butting collision between a special passenger train and a freight train moving out of a siding, damaging both locomotives and several cars.

20th, on Baltimore & Ohio, near Milford Junction, Ind., butting collision between two freights, due, it is stated, to one of the conductors misreading orders.

22d, on Western New York & Pennsylvania, near Portage, N. Y., butting collision between a passenger train and a freight on a curve, due to the mistake of an operator who wrote 206 for 286. The forward portion of each train was badly wrecked. Three trainmen and a wiper killed and three trainmen and two passengers injured.

24th, on Fort Worth & Denver City, near Cowen, Tex., butting collision between two freight trains. Engineer injured.

25th, on Georgia Southern & Florida, near Avondale, Ga., butting collision between a freight train and a switching passenger train, doing considerable damage. Several trainmen injured by jumping.

25th, on Missouri Pacific, near Centralia, Mo., butting collision between two freight trains, due to an operator's mistake. Engines and 10 cars wrecked.

26th, on Northern Pacific, near Tacoma, Wash., butting collision between two freight trains, piling up the forward half of each train in a bad wreck. Three trainmen injured. Misunderstanding of orders is said to have been the cause.

27th, on Chicago & Grand Trunk, near Battle Creek, Mich., butting collision between two freight trains in which both engines and 18 cars were piled up in a bad wreck.

27th, on Norfolk & Western, near Thaxtons, Va., butting collision between two freight trains, disabling the engines. Misreading of orders is said to have been the cause.

30th, on Georgia Pacific, at Atlanta, Ga., butting collision between a passenger train and a switch engine, damaging both locomotives.

30th, on Illinois Central, at Jackson, Miss., butting collision between a passenger train and a freight about to enter a siding, wrecking both engines and three box cars. It is stated that the passenger train was two minutes ahead of time.

31st, on Baltimore & Ohio, at Tiffin, O., butting collision between two freight trains, doing considerable damage.

CROSSING AND MISCELLANEOUS.

1st, on Chicago, Milwaukee & St. Paul, near Oakwood, Wis., passenger train ran into the caboose of a freight entering a siding, wrecking it and damaging the front end of the engine.

5th, on Northern Pacific, at Sprague, Wash., collision between freight train and switch engine. Fireman killed.

8th, at Williamsport, Pa., collision between a Philadelphia & Reading passenger train and a Pennsylvania construction train, throwing one of the engines over a high embankment. Two trainmen injured.

11th, on Memphis & Charleston, at Kansas City Junction, Tenn., a box car got away from the trainmen and ran down grade three miles into the yard of the Kansas City, Memphis & Birmingham road, where it collided with a switching engine, badly damaging both.

11th, on Pennsylvania, at Greensburg, Pa., a passenger train was backed into the rear end of a freight train, damaging several cars of both. Passenger brakeman and another employé injured.

12th, at the crossing in Mount Morris, N. Y., a Delaware, Lackawanna & Western passenger train was run into by a Western New York & Pennsylvania freight, derailing a baggage car and four coaches.

19th, on Chicago & Northwestern, at La Valle, Wis., a passenger train entering a siding was run into at the side by another passenger train, damaging two cars. Six passengers injured. The two trains had orders to meet at this station.

19th, on New York Central & Hudson River, in the Grand Central yard, New York city, collision between two switching engines in a blinding snowstorm. Fireman killed and another injured. One of the engines ran a few feet past a danger signal.

23d, on Union Pacific, at Omaha, Neb., collision between a freight train and a switching engine, damaging a number of cars.

25th, at East Birmingham, Ala., collision between Columbus & Western and Louisville & Nashville freight trains, doing some damage.

27th, at Birmingham, Ala., an Alabama Great Southern engine, in clearing the main track for an approaching freight, was by mistake switched on to a siding containing a string of Louisville & Nashville freight cars, damaging a number of them and overturning the engine.

31st, on Illinois Central, at Cobden, Ill., a stock train ran into the side of a freight train entering a siding. Engine disabled and several cars derailed.

DERAILMENTS.

DEFECTS OF ROAD.

4th, on Union Pacific, near Minnedoka, Idaho, passenger train derailed and several cars badly damaged at a culvert which had been undermined in a freshet. Two trainmen and several passengers injured.

4th, on Union Pacific, at Agate, Colo., 18 cars of a freight train thrown from the track by the spreading of the rails.

6th, on Kansas City, Memphis & Birmingham, near Jasper, Ala., freight train detached by a defective rail.

12th, on Central of Georgia, at Macon, Ga., 6 cars of freight train thrown from the track by the spreading of the rails.

12th, on Chicago, Burlington & Quincy, near Burlington, Pa., 14 cars of freight thrown from the track by the spreading of the rails, and wrecked.

13th, on Atchison, Topeka & Santa Fe, near Scranton, Kan., passenger train thrown from the track by a broken rail

14th, on Union Pacific, near Balock's, Ore., one engine of double-header freight train thrown from the track by the spreading of the rails, and overturned. Three trainmen injured.

17th, on Iowa Central, at Liscomb, Ia., 14 cars of a freight train were thrown from the track by a broken rail.

18th, on Louisville, St. Louis & Texas, at Bell's Switch, Ky., freight train ditched by the spreading of the rails.

22d, on Gulf, Colorado & Santa Fe, near Gainesville, Tex., freight train thrown from the track by the spreading of the rails.

25th, on Northern Pacific, near Heron, Mont., several cars of a passenger train were derailed and badly damaged, owing to the spreading of the rails, consequent upon a sudden thaw. Fire broke out and three cars were consumed. Baggageman killed and seven passengers injured.

28th, on Southern Pacific, near Willcox, Ariz., passenger train thrown from the track by a broken rail. The rear car was overturned and dragged some distance.

28th, on Burlington & Missouri River, at Rulo, Neb., a freight train was thrown from the track by the spreading of the rails, ditching the engine and a number of cars. Fireman killed.

29th, on Jacksonville, St. Augustine & Halifax River, near Jacksonville, Fla., engine and baggage car of passenger train thrown from the track by a loose rail, which, curving upward, was driven through one of the cars.

DEFECTS OF EQUIPMENT.

3d, on Housatonic road, at Norwalk, Conn., passenger train derailed by the breaking of a locomotive axle. The baggage car was thrown over against freight cars standing on an adjoining track, doing some damage. Several passengers bruised.

6th, on Cumberland Valley, at Plainfield, Pa., eight cars of freight train derailed and wrecked by the breaking of an axle. Brakeman injured.

6th, on Pennsylvania, near Trenton, N. J., a westbound freight train was derailed and partially wrecked by a broken axle. Some of the wreckage was thrown across the eastbound track in front of an approaching accommodation train, damaging the engine.

7th, on New York, Ontario & Western, at Cook's Falls, N. Y., freight train derailed and ditched by the breaking of a truck.

8th, on Norfolk & Western, near Big Spring, Va., 15 cars of a freight train were derailed and wrecked by the breaking of a wheel. Brakeman injured.

9th, on Louisville & Nashville, at Rollins, Ala., 16 cars of a freight train were derailed by a broken axle and badly damaged. Brakeman injured.

13th, on Georgia Pacific, near Horse Creek Mines, Ala., a freight train was derailed on a high trestle by the breaking of a wheel. The structure gave way under the derailed cars, all but the engine and car next to it going down into the creek below. The wreck was fired by the caboose stove and totally consumed. Five trainmen injured.

14th, on Grand Rapids & Indiana, near Clarion, Mich.,

13 cars of a freight train derailed by the breaking of a wheel.

16th, on New York, Lake Erie & Western, near Goshen, N. Y., freight car derailed by a broken wheel.

17th, on Chicago & Alton, near Venice, Ill., four cars of freight train derailed and wrecked by the breaking of an axle.

20th, on New York, Lake Erie & Western, near Middletown, N. Y., several cars of freight train derailed by a broken wheel.

20th, on Lehigh Valley, at Fullerton, Pa., an axle under a car of a freight train broke, wrecking a number of cars and blocking both main tracks.

NEGLIGENCE IN OPERATION.

4th, on Knox & Lincoln, in Rockland, Me., owing to a misplaced switch a number of freight cars were backed off the end of the track and damaged. Trainmen injured.

5th, on Chicago, St. Paul, Minneapolis & Omaha, near Washburn, Minn., a freight train descending a steep grade became uncontrollable and, after running some distance at high speed, five cars were derailed and wrecked. The master mechanic of the road, who was acting as engineer, and two other trainmen, were killed in leaping from the runaway train.

5th, on Louisville, New Orleans & Texas, near Rolling Fork, Miss., passenger train derailed at a misplaced switch, the engine and tender going into the ditch. Fireman injured.

6th, on New York, Lake Erie & Western, at Painted Post, N. Y., rear car of passenger train derailed at a switch and hurled against an engine standing on an adjoining track, doing considerable damage. Three passengers injured.

6th, on New York, Lake Erie & Western, at Elmira, N. Y., engine and caboose derailed by a misplaced switch.

12th, on Pennsylvania, in Jersey City, N. J., as a string of freight cars was being run on to a transfer boat, the boat became disconnected from the dock and three cars were thrown into the Hudson River. A brakeman went down with the cars and was killed.

19th, on Georgia Pacific, near Davisville, Ala., passenger train derailed by a misplaced switch. Express messenger injured.

20th, on Louisville & Nashville, near Frankfort, Ky., a freight train ran into a hand car, and the engine and seven cars were derailed and wrecked. Brakeman killed.

20th, on International & Great Northern, at San Marcos, Tex., forward end of a passenger train derailed by a misplaced switch.

22d, on Union Pacific, at Terra Cotta Junction, Kan., passenger train derailed by a misplaced switch, most of the cars being overturned in the ditch. Ten passengers injured.

22d, on New York, Lake Erie & Western, at Clifton, N. J., passenger train derailed by a misplaced switch and 2 coaches thrown over on their sides. Several passengers cut by broken glass.

23d, on Chicago, Rock Island & Pacific, near Stockbridge, Mo., pay train ran over a misplaced switch, overturning the pay car and injuring an occupant.

25th, on Northern Pacific, near Cascade, Wash., several cars loaded with logs broke loose from a construction train and ran back down grade. The runaway cars were turned on to a side track at Cascade and crashed into a station building, doing considerable damage.

25th, on Gulf, Colorado & Santa Fe, at Cleburne, Tex., forward portion of a freight train was derailed by a misplaced switch and ditched.

25th, on Columbia & Puget Sound, at Renton, Wash., engine and three cars of a freight train derailed at a misplaced switch.

UNFORESEEN OBSTRUCTIONS.

1st, on Peoria, Decatur & Evansville, at Lincoln, Ill., engine and six cars of a freight train derailed at a switch which had been purposely misplaced.

2d, on Baltimore & Ohio, at Dunbar, Pa., a freight train ran into a box car which had been derailed and thrown over so as to foul the opposite track, wrecking the engine and eight cars. An employé riding on the locomotive was injured.

6th, on Central of Georgia, near Nickajack, Ga., engine, baggage and mail cars of passenger train derailed by a purposely misplaced switch.

13th, on Denver & Rio Grande, near Osier, Colo., two engines of passenger train derailed at the entrance of a tunnel by ice on the rails. Engineer hurt.

14th, on Lake Shore & Michigan Southern, near Andover, O., engine of freight train derailed and slightly damaged at a switch which had been spiked by train wreckers.

14th, on Baltimore & Ohio, at Black Hand, O., a passenger train ran into a large boulder which had rolled down upon the roadbed. The engine was thrown down an embankment into a creek and a number of coaches were badly damaged. Fireman killed, engineer, a man riding on the locomotive and 5 passengers injured.

16th, on Denver & Rio Grande, near Canon City, Colo., a freight train was struck by a huge landslide, wrecking 11 cars.

17th, on Missouri, Kansas & Texas, near Little River, Tex., a construction train moving backward ran over a cow. Several cars filled with laborers were derailed and thrown over an embankment, killing 1 and injuring 4 others.

19th, on Pennsylvania, at Bagdad station, Pa., a freight train ran into a boulder which had rolled down upon the track in a cut. The engine and 5 cars were derailed and thrown into a river. Three trainmen injured.

20th, on Lehigh Valley road, at Fullerton, Pa., a westbound freight train ran into wreckage thrown over from an adjoining track, wrecking the forward portion of the train.

23d, on Perkiomen road, near Green Lane, Pa., a freight train ran into a large rock which had rolled down upon the track. Engine and several cars derailed and damaged.

27th, on Jeffersonville, Madison & Indianapolis, at Vienna, Ind., a passenger train was struck by a tornado and overturned. Engineer killed, fireman injured.

28th, on Northern Pacific, near Avon, Mont., a freight train ran over a cow, and the engine and 12 cars were derailed and ditched. A number of telegraph poles were also knocked down, interrupting communication.

28th, on Louisville & Nashville, near Sebree, Ky., a freight train was derailed and ditched by a large tree which had been blown across the track. Three trainmen killed.

UNEXPLAINED.

1st, on San Antonio & Aransas Pass, near Sublime, Tex., engine and three cars of freight train derailed, injuring two trainmen.

1st, on Mobile & Birmingham, near Selma, Ala., engine and three cars of a passenger train derailed.

1st, on Union Pacific, near Hardin, Colo., freight train derailed and several cars wrecked.

2d, on St. Paul, Minneapolis & Manitoba, at Calais, Mont., engine and five cars of a freight train derailed. Engineer killed.

4th, on Union Pacific, at Harper's, Wyo., three cars of passenger train derailed.

4th, on Richmond & Danville, near Fort Mills, Ga., seven cars of freight train derailed and ditched.

6th, on New York, Lake Erie & Western, at Coat's Switch, N. Y., seven cars of freight train derailed.

6th, on Cumberland Valley, at Shippensburg, Pa., engine of freight train derailed and disabled. Fireman injured.

6th, on Ohio Valley Road, near Highland Creek, Ky., the caboose of a freight train was derailed and wrecked. Two trainmen killed.

7th, on Milwaukee, Lake Shore & Western, at Milwaukee, Wis., engine and several cars of a freight train derailed and thrown over an embankment. Engineer hurt.

7th, on Central of Georgia, at Butler, Ga., three cars of freight train derailed.

7th, on Central Pacific, at Cisco, Cal., several cars of a freight train were derailed at a snowshed and knocked down part of the structure.

7th, on Manhattan, near Third avenue and 89th street station, New York City, locomotive derailed at a switch.

7th, on Birmingham Mineral, near Gurley, Ala., three cars of wrecking train derailed and badly damaged. Two trainmen were injured, and cars caught fire and were consumed.

7th, on Knoxville, Cumberland Gap & Louisville, near Tazewell, Tenn., passenger train derailed. Two trainmen injured.

9th, Louisville & Nashville, near Deatsville, Ala., 18 cars of freight train derailed and wrecked.

9th, on Pennsylvania, at Sonman, Pa., freight train derailed and three cars wrecked.

10th, on Georgia Railroad, near Augusta, Ga., eight box cars and two passenger coaches of a mixed train were derailed.

11th, on Missouri, Kansas & Texas, near Dallas, Tex., three cars of freight train derailed and damaged.

11th, on Philadelphia & Reading, near Rose Glen, Pa., engine and six coal cars derailed and damaged.

13th, on Pennsylvania, at Torrens, Pa., freight train derailed, damaging five cars.

14th, on Illinois Central, near Makanda, Ill., eight cars freight train derailed.

15th, on Pennsylvania, at Kittaning Point, Pa., freight train consisting of engine and nine cars derailed and wrecked. Brakeman injured.

16th, on Louisville & Nashville, near Birkner's, Ill., freight train derailed and a number of cars ditched.

17th, on East Tennessee, Virginia & Georgia, near McRae, Ga., freight train derailed and three cars wrecked.

18th, on Pittsburgh, Cincinnati & St. Louis, at Barnetts, Pa., freight train derailed and a number of cars wrecked.

19th, on Pennsylvania, at Mineral Point, Pa., engine derailed.

19th, on Boston & Maine, at Newburyport, Mass., engine and one car of freight train were derailed at a bridge over the Merrimac River. A heavy snow storm prevailed at the time. Fireman jumped and was slightly injured.

20th, on St. Louis, Iron Mountain & Southern, near Gurdon, Ark., engine and 10 cars of a freight train broke through a bridge.

21st, on Georgia Pacific, near Cordova, Ala, a freight train consisting of engine and 13 cars broke through a trestle. Conductor killed, six other trainmen injured.

22d, on Delaware & Hudson Canal Co.'s road, near Saratoga, N. Y., three cars of freight train derailed and ditched.

24th, on Lake Erie & Western, near Arcadia, O., engine and nine cars of a freight train derailed and thrown down an embankment.

26th, on West Jersey road, at Townsend's Inlet, N. J., two cars of switching freight derailed and thrown across the track.

26th, on St. Louis, Iron Mountain & Southern, near Alexandria, Ark., engine and baggage car of passenger train derailed.

26th, on Old Colony road, at Leominster Centre, Mass., three cars of a freight train were derailed at a switch and badly damaged.

29th, on Georgia Southern, near Tifton, Ga., several cars loaded with logs in a freight train were derailed, killing an employé.

30th, on Pittsburgh, Cincinnati & St. Louis, at Dinsmore, Pa., car of a freight train derailed.

31st, on Missouri Pacific, at Osage, Mo., engine of freight train derailed.

OTHER ACCIDENTS.

1st, on Union Pacific, near North Platte, Neb., drumhead of heater in a car of a passenger train blew out, causing some damage.

3d, on Boston & Maine, near Boston, Mass., car in a passenger train caught fire from the steam heating pipe.

4th, on Virginia Midland, near Union Hall, Va., box car of a mixed train broke down.

5th, night, on Union Pacific, at Wall Cut, near Wheeler, Colo., two passenger trains, one of which had coupled to the rear of the other, on account of difficulty in getting through the snow, were struck by an immense snow slide, which completely buried the mail cars and four engines. An employé who was on the front of the foremost engine of the hindmost train was swept several hundred feet down the valley and severely injured, and a fireman was badly scalded.

6th, on Chicago, Milwaukee & St. Paul, near Winona, Minn., Pullman car of northbound passenger train caught fire and was damaged.

14th, on Illinois Central, near Centralia, Ill., engine of wrecking train broke a parallel rod, and the loose end tore a hole in the boiler.

18th, on Chicago & Northwestern, near Ashton, Ia., nearly all the windows on one side of a passenger train were broken by the projecting tongue of a coal wagon, which had been stalled at a street crossing. Several passengers injured by flying glass.

20th, on Lehigh Valley, near Glen Onoko, Pa., axle under car of freight train broke.

25th, on Ohio & Mississippi, near Louisville, Ky., engine of passenger train broke a parallel rod, a loose end of which demolished the cab. Engineer injured.

26th, on New York, Lake Erie & Western, at Lanesboro, Pa., the roof of a car in a freight train was blown off in a gale. A section man standing near the track was struck by it and badly injured.

31st, on Toledo & South Haven, near Lawton, Mich., engine of passenger train slightly damaged by running into some ties which had been maliciously placed upon the track.

A summary will be found in another column.

A Ride Over the Pennsylvania.

One of the most interesting things to be seen in a daylight ride over the Pennsylvania road from Pittsburgh to Philadelphia is the almost complete restoration of the track to the condition which existed before the great floods of last summer. Generally speaking, no one but a person who had been very familiar with the track before the flood would notice any change. There are still two or three bridges unfinished, notably the stone arch bridge near Conemaugh; and in the immediate vicinity of Conemaugh and Johnstown the roadbed still shows traces of the terrible ravages of the flood. On the eastern side of the mountains, however, all of these marks have practically disappeared.

Another fact which a railroad man will notice is the almost complete protection by signaling. This, of course, is a familiar fact, but probably the completeness of the protection is not realized even by most railroad men. Of course there are block signals throughout the whole length of the line; these being the plain tower blocks. All facing-point switches are protected by distant signals and high switchstands have pretty much disappeared. All junctions are interlocked, except within yard limits, where there is still some interlocking to be done. Even the track tanks are supplied with targets. Apparently the next step in signaling on this road will be in shortening the length of the blocks, and it seems as if this step must be taken soon. Whether it will be by establishing more towers, and then the introduction of the Sykes locking, or whether it will be by the introduction of some automatic system of signaling, of course no one outside the councils of the road can tell; but, so far as can be judged from what we hear, we should suppose that the next great step taken by the Pennsylvania in block signaling would be in the use of some form of track circuit.

One notices various experimental rail joints in use. On the western slope, not far from Johnstown, a number of Thomson joints may be seen in the track, and others may be seen in the eastern slope near Altoona. The English chair, standard on the London & Northwestern, may also be seen at various places. The angle-splice is, however, standard and the number of experimental joints used is trifling in comparison with the number of angle splice joints. Both the 6-bolt and 4 bolt angle-splice, suspended, are used. The Wharton switch has pretty nearly disappeared. It is seen only at a few outlying crossovers and sidings which are but seldom used.

Locomotive Counter Balancing.

At the April meeting of the Western Railway Club Mr. W. H. Lewis (Master Mechanic, C., B. & N.) read the following paper:

It is the object of this paper to consider, without entering into the mysteries of abstract science, the proper amount and distribution of counter-weight in the driving wheels of the locomotive, and the propositions offered will be based on the fundamental principles of the law of gravity, and its development into momentum and centrifugal force, in the reciprocating and revolving parts. In order to analyze the conditions of the problem as clearly as possible, we will at first deal with the revolving weight independent of the reciprocating weight.

Starting with the problem of balancing the revolving weight, we will present the proposition that the counter-weight be so located, and be of such weight that the revolving weight be balanced in a state of rest, with the crank in any position. Acknowledging this self-evident proposition, it follows that the counter-weight must be located with its centre of gravity exactly opposite that of the revolving weight or crank; also, that, according to the principles of leverage, the weight of the counter-weight and the weight of the revolving parts must be inversely proportionate to their respective distances from the centre of axle as fulcrum of lever.

In other words (as per fig. 5) the counter-weight, D, multiplied by B, the distance from its centre of gravity to centre of axle must be equal to the revolving weight, C, multiplied by A, the distance from its centre of gravity to centre of axle. Hence, as per fig. 5,

$$A \times C = B \times D, \text{ and } A : B :: D : C.$$

Example: The distance from the centre of gravity of a revolving weight of 200 lbs. to the centre of the axle is 12 in., and the distance of the centre of gravity of the counter-weight of 100 lbs. is 24 in., because

$$\frac{200 \times 12}{24} = 100 \text{ lbs. and } \frac{200 \times 12}{100} = 24 \text{ in.}$$

If the foregoing conditions of static or stationary balance have been obtained, the development of centrifugal force, as a result of rotary motion, will also produce a dynamic or moving equilibrium, as will be seen by the following examples according to the formula of centrifugal force, which is as follows:

$$\text{Centrifugal force} = \text{weight of body} \times \frac{(\text{veloc. in ft. per second.})^2}{(\text{radius in ft.}) \times 32.2}$$

Suppose, as in the previous example, we have a crank, a revolving weight of 200 lbs., with centre of gravity at 12 in. from centre of axle, balanced by a counter-weight of 100 lbs. with its centre of gravity at 24 in. from centre of axle, the revolving speeds being 50, 100 and 200 revolutions per minute.

According to the formula above given we have the following result:

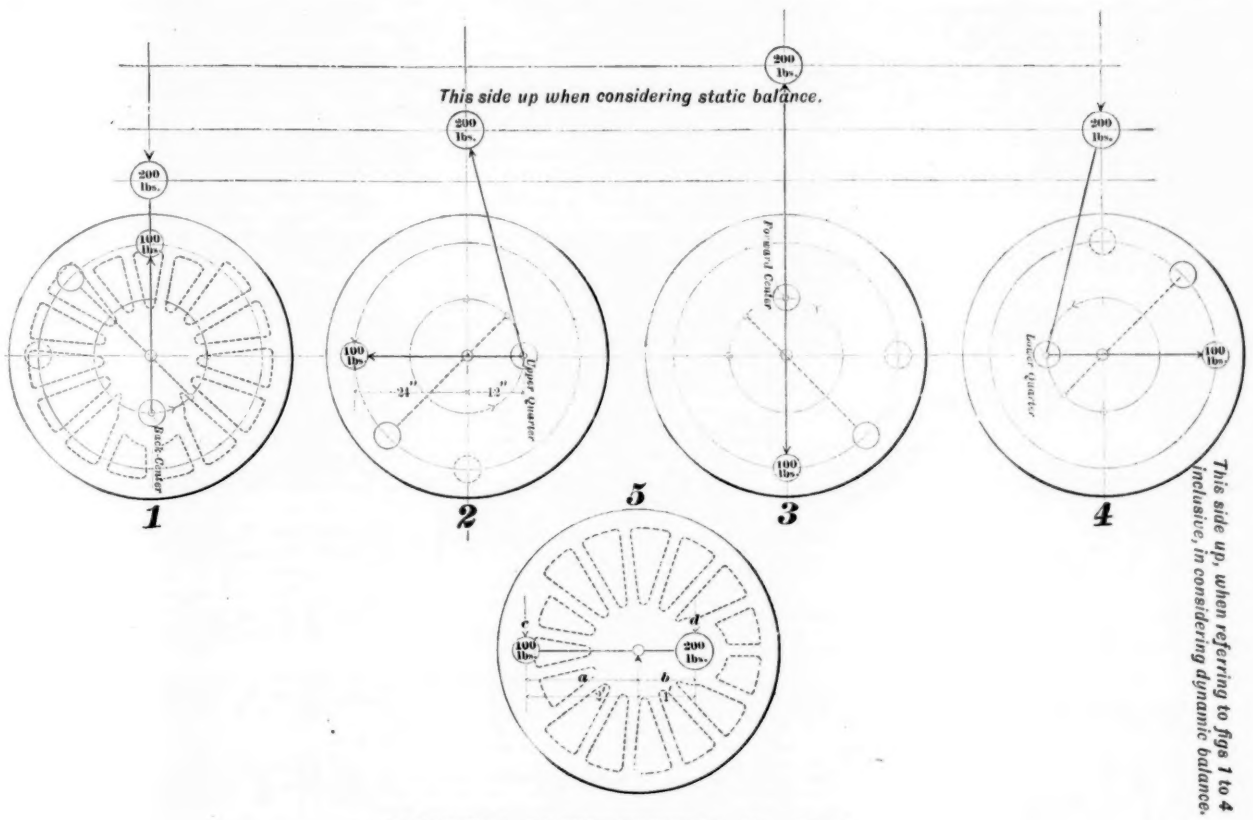
Centrifugal force of revolving weight and its counter-weight at 50 revolutions per minute = 170 lbs.

Centrifugal force of revolving weight and its counter-weight at 100 revolutions per minute (which is twice the above speed) would be found equal to $2^2 \times 170$ lbs. = 681 lbs.

In the same way the centrifugal force of the revolving weight and its counter-weight at 200 revolutions (which is twice the above speed) would be found equal to

$$2^2 \times 681 = 2{,}724 \text{ lbs.}$$

To balance the reciprocating weight we must have the



LCCOMOTIVE COUNTER-BALANCING.—Figs. 1 to 5.

same conditions of static balance existing between it and its counter-balance, which will appear in figs. 1 to 4, where, in order to consider the force of gravity, an upright position of cylinder is assumed. It will be seen that a perfect static balance is obtained by means of the counter-weight shown, with crank in any imaginable position.

In this case we find by reference to figs. 1 to 4, representing a driver turning from right to left, that, at the forward and back centres, we have a perfect dynamic balance, because at those points the uniform centrifugal force is all absorbed in overcoming the increased momentum of the reciprocating weight and in changing the direction of its motion. The arrows indicate the direction of the tendency of the reciprocating weight and its counter-weight. In figs. 2 and 4 we have the reciprocating weight and its equivalent counter-weight moving in opposite directions, and the product of the square of their horizontal velocities, multiplied by their respective weights, are equal; hence, the horizontal balance is perfect, but the centrifugal weight of their counter-balance is not counteracted by the reciprocating weight.

By the above it will appear that the reciprocating weight is perfectly balanced at all points by the revolving counter weight, but the counter-weight is balanced by the reciprocating weight at the dead points or centres only. Hence the effect of the revolving weight as applied to balance the horizontal action of the reciprocating weight is only to convert it to a vertical force acting on the rail, producing what is termed a hammer blow.

Therefore a solution of the problem will involve the choice of the lesser evil; that undoubtedly is the hammer blow, considering the smoothness of running and the durability of the engine and the comfort of enginemen.

As to the distribution of this counter-weight for the reciprocating weight, it is evident that the time-honored custom of dividing this counter-weight equally between connected drivers is not effective unless the effect of this counter-weight can be uniformly transmitted to the main driver, which is a condition impossible to fulfil by means of the ordinary parallel rod, with the longitudinal play or lost motion, which it must necessarily possess or acquire in the course of time.

From the preceding it appears that the proper method of balancing the drivers would require that the counter-weight of the main drivers be equivalent to the revolving weight added to the whole of the rociprocating weight. (Revolving weight, including pins, hub and forward end of parallel rod and one-third of the main rod. Reciprocating weight, including the other two-thirds of the main rod; cross head, and piston and its attachments. This condition of course leaves only the revolving weight of the connected drivers to be balanced by its equivalent counter-weight as per condition above shown. While the above statement is theoretically correct, my observation of the effect produced on tires on our engines leads me to believe that under certain conditions of speed the weights intended to counter-balance the reciprocating parts produced opposite results to those intended, and work considerable damage to the machinery of the engine as well as of the track. I have found that the tires invariably develop a flat spot at the point of contact with the rail when the left hand pin has just passed to the forward centre. You will perhaps ask why the same effect is not produced by the corresponding point on the back end of the stroke. I will explain this by saying that the point of contact of the periphery of the wheel with the rail is near the point of the centre of gravity of the counter-weights and has a tendency to overcome or retard the centrifugal force. While in the former case, with the centre of gravity on the upper quarter, it is free to reserve a leverage acting in the same direction as the power applied from the cylinder, causing a slight slipping of the wheel.

It may be interesting to know to what extent the reciprocating weights may be ignored. I will say that in testing the balance of a modern engine that was built expressly for a heavy passenger service, I find that the back wheels require 189 pounds with the centre of gravity 26 inches from the centre of axie. To balance the revolving weight one-half the side-rod (980 pounds) and half the forward wheels had only 368 pounds of counter-balance with which to balance 908 pounds, as follows: main-rod 315 pounds, half side-rod 160 pounds, cross-head 157 pounds. piston 276 pounds, total 908 pounds; or, in other words, the reciprocating weights were entirely ignored in the forward wheels, and the back wheels are 189 pounds short of the proper revolving balance. These engines were in service nearly four years before the balance was corrected, without known injury to the track.

I am free to admit that when all the various conditions of speed, power applied, effect of pressure in the cylinder, etc., are considered, it is to me a very perplexing problem as to just what portion of the reciprocating weights should be applied to the counter-balance. Let us consider for a moment the power exerted by a cylinder 18 in. in diameter with an area of 254.46 in., with a steam pressure of 45,024 lbs., acting in the same direction of the reciprocating weight. It seems to me that 600 lbs. of counter-balancing supplies an imperceptible resistance to its effect. In condensing my opinion on this subject I will say that it is impossible to distribuue such portion of reciprocating weight as will insure a uniform motion under the varying conditions of speed, power applied, and with engines running, as they are required to at times, without pressure of steam ordinarily called "shut-off;" that if the revolving balance is perfect no injury is possible to the machinery or rails, and, while at high rates of speed the engine may develop a disagreeable, oscillatory motion—and it is known as a fore and aft—when shut off the vertical or hammer-blow motion will be reduced to a minimum.

Mr. Lewis here presented the following figures showing change made by him in one engine and the balance in another.

ENGINE 150 (TEN-WHEELER, 56-IN. WHEEL CENTRE).

Weights of Revolving Parts.	Front.	Main.	Back.
½ Front side rod	107	....	....
Middle connections	....	275	....
Back half main rod	....	263	....
		568	
½ Back side rod	....	....	134
Weight of reciprocating parts.			
Front half main rod	....	216	....
Crosshead	....	165	....
Piston complete	....	303	....
Total weights to be balanced	107	1,252	134
Present balance	107	630	110
Former balance	425	585	405

ENGINE 10 (EIGHT-WHEELER, 63-IN. CENTRE).

Weights of revolving parts.	Front.	Back.
Front half side rod	121	
Back half main rod	157	
	278	
Back half side rod		121
Weights of reciprocating parts.		
Front half main rod	113	
Piston complete	255	
Crosshead	145	
	513	
Total weights	791	121
Balance	385	230

After reading his paper Mr. Lewis stepped to the blackboard, and, drawing the sketch (fig. 6), said:

I wish to call attention particularly to the effect of excessive counter balance on the wear of tires. All of our locomotives are counter-balanced with the full weight of the reciprocating parts, and we have found that our left hand main tires universally develop a flat spot at the point of contact with the rail, with the driving wheel in the position as shown in the diagram.

We have at this point of the stroke the full pressure of steam exerted on the left hand pin in the direction as shown by the arrow, and at the same time the centre of gravity of the counter-weights have so nearly reached the vertical point as to overcome the effect of gravitation, the inertia of which is exerting an impelling motion in the same direction as the power applied at the pin.

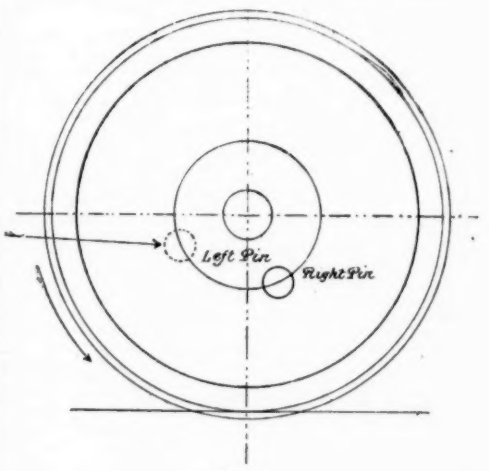


Fig. 6.

Mr. D. L. Barnes here offered the following explanation of the flat spot being on the left hand side, sketching his diagram upon the blackboard (fig. 7).

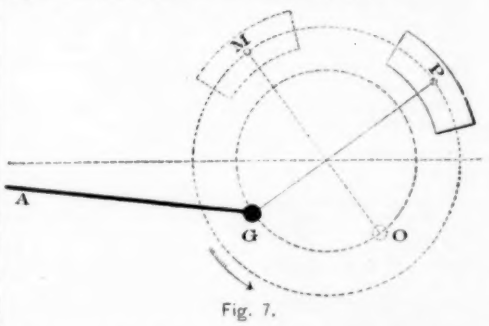


Fig. 7.

It may arise from the fact that the right hand crank usually leads on American engines. This sketch shows the positions of the right hand crank pin at *O* and the left hand crank pin at *G* with the counter-balance directly opposite the cranks, the left hand counter-balance being at *P* and the right hand at *M*, the direction of motion being as shown by the arrow, the engine moving ahead. *A* represents the connecting rod. In the position shown it will be noticed that the counter-balances on all four wheels are above the centre of the wheel, and the centrifugal force of that portion of the counter-balance which is used to balance the inertia of reciprocating parts is in this position tending to lift the wheels from the rails. This, of course, would reduce the weight on the wheels and induce slipping, which would cause flat spots at the point of slip. The position of the flat spot described by Mr. Lewis is on the left hand wheel, where it is in contact with the rail when the left hand crank *G* has just passed the dead centre, not quite as much as is shown in the sketch. At this time the balance *M* is higher above the centre line than the balance *P*, and therefore the balance *M* is acting with greater force vertically and tends to lift the right hand wheel more than the balance *P* tends to lift

the left hand wheel. There is, therefore, greater weight on the left hand wheel at this time, and if the wheel be caused to slip, the wheel with the greatest weight thereon will be worn the most; and as the left hand wheel has the most weight, it might be expected that the flat spot would be greater on it than on the right hand wheel. There is still another reason why slip would be liable to take place at this time, and that is the cranks are in a position corresponding to one of the maximum turning moments. As a locomotive's drivers revolve, the turning effect by the connecting rods is variable, and during one revolution there are four points of maximum and four of minimum effect. The points of the maximum vary with the point of cut-off. The obliquity of the connecting rod for the left hand wheel is such at this time as to increase the pressure of the rail on that side, as at this time the left hand cylinder is working steam full boiler pressure, whereas on the opposite or right hand side the piston is working in expanding steam, and possibly against some back pressure. This point is well brought out by Mr. Lewis. If the right hand crank did not lead, but the left instead, then the greatest turning moment would take place when there was the greatest weight on the right hand wheel. These arguments are somewhat speculative, but indicate a possible explanation of the occurrence of the greater flat spot on the left hand wheel, as noticed by Mr. Lewis. In my own experience I have noticed four flat spots on each driver, some of which were larger than others; but I had not noticed that the maximum spots occurred on the left hand main driver, but I can see reasons why such might be the case.

Mr. BARR: If the drivers slip, why have not you got the flat spot on both wheels opposite, and why not on the back wheels as well as on the front wheels.

Mr. D. L. BARNES: I can not tell you that; I know you will find it on all wheels.

Mr. W. H. MARSHALL: I have noticed this same development of flat spots. You will find a flat spot on the right ride, though not to the same extent as on the left side.

Mr. LEWIS: The angularity of the rod also has something to do with this matter, I think.

Mr. RHODES: Do I understand you, Mr. Barnes, that, the wheels revolving around, as the balances go up, the tendency is to lift the wheel up?

Mr. BARNES: Yes. The balance that is in the wheel to balance the revolving weight does not tend to lift it; it is only the part that is put in to balance the reciprocating part that produces the lifting tendency.

Mr. BARR: If this flat spot is caused by a slip I do not understand why the back wheel does not show the same trouble. There is a tendency on some engines on the right hand side to show a flat spot where it passes the front centre also.

Mr. LAUDER: I believe we shall have to do a good deal as Mr. Barr has indicated—if he had an engine that didn't work right he proceeded to make it right. You can hardly find two men that will agree upon this subject, and when you get it at all summed up there is no rule that can be presented that will give you the proper amount of counterweights and the proper position for the weights in the wheels. If the revolving parts to be balanced are the same as though they were revolving on a shaft, we know we can balance them, and the matter of speed does not come in at all. Whether it is so with a wheel running on a track is something that will bear argument, and I am not going to make any statement on that point, because I don't know. I know of no rule that can be given to balance a locomotive driving wheel except to guess a little. I mean figure a little, and, practically, the least you figure the better. Keep trying and experimenting until you get the thing about right. The more nearly you get the engine riding steadily the less inequalities there will be in the wear of the tire.

Mr. BARR: I have here a few figures regarding a class of engines that we have, which have given a great deal of trouble, and of which engineers complain very bitterly. We have two classes of ten-wheel freight engines, one with wheels 54 in. in diameter over tire and the other 60 in. The engines with 60-in. wheels give very satisfactory service, and are run fast; the engines with the 56-inch wheels have been objected to seriously by the engineers, and I think with quite good cause. The figures I have here show the changes in the counterbalancing of one of these engines with 54-in. wheels. I submit them as illustrating an experiment that has given very satisfactory results. The engine is now running in service with the 60-in. driver engines, and so far as I have reports, the engineers would just as soon run that engine with 54-in. wheels as the engines with the 60 in. wheels, and they say it climbs a hill a little bit better.

Changes made in weight of rods and counter-balance of engine No. 469:

		Lbs.
Old M. rods weighed		1,170
New " "		900
Old S. " "		1,344
New " "		858
Forward D. wheels were balanced with		363
" " " now " "		413
Main " " were " "		395
" " " now " "		819
Back " " were " "		413
" " " now " "		313

There was no change made in the back driving wheel's counter-balance.

R. M. driving wheel's crank pin to be balanced as follows:

	Lbs.
⅙ weight of R. F. S. rod	107
⅔ " main "	360
⅙ " R. B. S. "	108
⅙ " reciprocating parts	230
Estimated weight of crank, hub and pin	120
Main D wheel's counter-balance	865

R. B. driving wheel's crank pin to be balanced as follows.

	Lbs.
⅙ weight of R. B. S. rod	108
1-3 " reciprocating parts	230
Estimated weight of crank pin and hub	120
R. B. D. wheel's counter-balance	458
Engine No. 469 R. crosshead weighed	172
" " piston weighed	369
" " F. S. rod "	214
" " B. S. " "	216
" " main " "	450
" " crank hubs and pins weighed (estimated)	360
	1,781

The reciprocating parts are as follows:

	Lbs.
Cross-head	172
Piston	369
⅛ of main rod	150
	691
⅓ of 691 lbs	230⅓

R. F. crank pin ought to be balanced as follows:

	Lbs.
½ of R. F. S. rod	107
½ of reciprocating parts	230
Estimated weight of R. F. pin and hub	120
R. F. D. wheel's counter-balance	457

The Secretary here read a series of propositions concerning counter-balancing, submitted by a member of the Club. These propositions were as follows:

The subject of counter-balancing seems to be a very important one, and well worthy of the attention of the members of the Western Railway Club; and, therefore, to assist in bringing to their attention some of the new points with reference to the subject, the following statements which have appeared from time to time in the technical papers, and some which have not, are offered for debate:

First. The best way to reduce the amount of counter-balance in locomotive driving wheels and its effect on the rail is to reduce the weight of the reciprocating parts.

Second. The weight of the reciprocating parts of our locomotives is altogether too heavy as they are now made, and therefore all main rods should be made of I section, all crossheads should be as light as possible to make them without decreasing the wearing surface. All pistons should be made of cast steel or wrought iron, very thin and dished in form, and piston rods should not be made larger in diameter or longer than is actually necessary. Further than this the stub ends of the main rod at the front should have the least possible amount of material therein consistent with strength.

Third. The diameter of the driving wheels should be made as large as possible without reducing the hauling capacity of the locomotive in order to reduce the effect of the counter-balance on the rail, it having been shown that an increase in diameter of wheel produces a considerable decrease in the effect of the counter-balance on the rail.

Fourth. It is not as advisable to decrease the stroke as to increase the diameter of the wheel, because for the same loss of hauling capacity the increase in wheel diameter produces the greatest amount of reduction in the effect of the counter-balance on the rail.

Fifth. If one high speed and one low speed locomotive be counter-balanced by the same formula, the effect on the rail will be much greater in the case of the high speed locomotive, for the reason that the effect of the balance on the rail varies as the square of the velocity of the locomotive. Therefore it might be said:

Sixth. That if the high speed locomotive can be run satisfactorily when balanced according to a given formula, that a low speed locomotive can be balanced by a formula which would give less total balance. In other words, the lower the speed the less balance required, and the higher the speed the greater the balance should be.

Seventh. It has been stated by several prominent civil engineers who are occupying responsible positions on Western railroads, that a locomotive can be run satisfactorily at high speed without balancing the reciprocating parts at all, and because such balance is damaging to the track it should be entirely removed. One railroad company has been experimenting with locomotives without counter-balance for reciprocating parts, but the results are not known.

Eighth. There are now on record about ten cases in which the track has been badly damaged by high-speed locomotives improperly counter-balanced. These cases are on Western roads, and this will serve to show the necessity for a consideration of this subject by the Western Railway Club, and that it is in keeping with the custom of the Club, which is to discuss only live topics.

These remarks are offered with the hope that if the Club approves of any or all of the statements they will offer resolutions to the effect that those of which they do approve express the sense of this meeting.

As the hour was late the propositions were laid over for discussion at the May meeting. A few remarks were made by Messrs. Rhodes, Barr, Barnes and Marshall, however, brought out by proposition two, in which the danger of running disconnected engines at high speed was brought out. Cases were cited where the effect of unbalanced counter-weights in drivers, where a disabled engine was run in with one side disconnected, or where a new engine, entirely disconnected, was being hauled over the line in a high-speed train, had caused serious damage to track. With lighter reciprocating parts, as advocated in proposition two, this danger would be lessened, as the counter-weights would be ligther, but it was further argued that restrictions upon the speed of disconnected engines should be made, and Mr. Barr stated that such restrictions were now made on his road.

The Strong Locomotive.

We have the following from an officer of the Cincinnati, Hamilton & Dayton: The Strong engine has been running on our road for some time, and has done remarkably clever work. She has capacity for handling a large train in a most remarkable manner, and has given us a great deal of satisfaction. Of course, you will understand that she is a great deal heavier than our average engine; in fact, she is a little too heavy for most of the Western roads. I have ridden on the Strong engine, pulling seven cars at the rate of a mile in 42 seconds for some distance. The grade was not absolutely level, but from 10 to 15 ft. per mile up grade. We made one mile that I remember, on practically a level grade, or slightly down hill, as near as I could get at it with a stop watch, in 40 seconds. I have been on this engine when she ran up hill eight miles with nine heavy vestibule cars, making fair schedule time, and arriving at the top of the hill blowing off steam and carrying a steam pressure of 170 lbs. to the square inch, and she did this, as near as we can measure with ordinary railroad appliances for measuring fuel, with just one-third less coal than would have been consumed by the regular engine belonging on this run. The engine that belonged on this run is a thoroughly equipped 18 × 24-in. cylinder, 100,000-lb. engine, and will compare favorably with the engines of any road in the country.

The second point to me in favor of Mr. Strong's engine is the manner in which the boiler is hung in the frames. There is absolutely no pounding on the joints or rails, and she rides as easily as a Pullman car. The true fact of the matter is that this engine, weighing 66½ tons, is not as hard on the joints or rails as an ordinary 50-ton engine. This we have demonstrated to our entire satisfaction, and it is on account of her system of equalization. My opinion from experiments with her is, that if an engine was built lighter than the No. 1, which we are using, on a basis of the present 50-ton American type of passenger engine, it would give us, say, 30,000 lbs. on the truck, 65,000 lbs. on the drivers, and 18,000 lbs. on the trailing wheels under the firebox, and we should have an engine that would do at least 33 per cent. more work for less fuel, in the proportion as given above, and be much easier on the track, with much more comfort to the passengers.

I have tried at various times to overcome the troubles with smoke and cinders on trains used by commuters, and other local passenger trains. I have tried nearly every smoke box that has been developed so far, and have tested coke in the ordinary 8-wheel American engine under almost all the different circumstances that can be imagined, trying coke burnt especially for locomotives all the way from 32 to 96 hours, and am convinced that with this firebox and combustion chamber we can get practically a train free from cinders and smoke, and come as near the English coke-burning engine as it is possible for us to go. I am comparing this now with the theories of the English locomotive builder. I understand that it is a fact that they have never got at the point they claim they have.

Water in the states of Ohio and Indiana is so hard that it is a very important question to us, in fact, so much so that our fireboxes last, as a rule, from 25 per cent. to 33 per cent as long as they should. On one division 25 per cent. would be a liberal allowance for the life of a firebox compared with portions of the Erie. In Mr. Strong's boiler and firebox it is impossible for the scale to accumulate. There is nothing to hold it, and the slight movement from contraction and expansion causes it to crack as fast as it is formed and drop down, where it is washed or blown out in the shape of a powder when the boiler is cleaned. As an illustration of the above statement, I can state positively that these fireboxes were examined carefully, after 18 months service, about two weeks ago in our shop. They were found absolutely free from scales, which is the first time in the history of the road that such a thing has occurred. You will also readily understand that the absence of seams, rivet heads, etc. in this corrugated firebox goes a long ways towards helping the matter. There is no portion of the firebox where there is more than a single thickness of metal between the heat and the water. Our Superintendent of Motive Power reports, after a very careful examination, that the boiler, fireboxes and combustion chamber are as good to-day as they were 18 months ago, when the engine was constructed.

It would be an impossibility to make the very high speed accomplished by this engine with the ordinary valve gear, as you could not get rid of the excessive compression and back pressure with the early points of cut off which would be necessary to retain the steam supply. If any one wants to make a high speed, unquestionably this valve is a necessary feature of the engine; but I would be satisfied with going a little more slowly. If the dear public demands the high speed, it comes down to the simple question of getting rid of your steam, which we cannot do with the ordinary valves. We have had this engine now about 90 days, and have tested her very thoroughly up and down hill, running her over very hilly portions of the road, and also on long stretches of dead level. About the only trouble we have had so far is to keep the gentlemanly engineer from running away from his schedule.

The New Era Grader.

This machine, which has been for many years in considerable use, has lately been improved in various details, and is now largely used by contractors in railroad work, building highways, in irrigation work and, in fact, wherever large quantities of earth need to be handled. It can be operated wherever a plow can be used, and is supplied with carriers adapted to different dimensions of cut and fill. It is said that with six teams and three men from 1,000 to 1,500 cubic yards of earth can be handled in ten hours, or from 600 to 800 wagons loaded. The cost of handling work with this machine is generally estimated at from 20 to 30 per cent. that of plow and scraper work. The machine differs from most others of its kind in that it does its own excavating and at the same time carries the earth where it is wanted. It is made by the F. C. Austin Mfg. Co., of Chicago, Ill., who publish many testimonials as to its performance, from railroad contractors and others.

Track Tanks on the Reading.

The Philadelphia & Reading is about to commence work on a pair of track tanks, which will be built on the Delaware River bridge, just west of Trenton Junction. Tanks 1,200 ft. in length will be placed on both tracks, and steam pipes are to be laid on either side of the tanks to keep the water from freezing in winter. This will enable Reading locomotives to run through from Philadelphia to Jersey City, and will do away with the stop and change of engines at Bound Brook, which is now made. The running time between Jersey City and Philadelphia may then be shortened a few minutes.

THE SCRAP HEAP.

Notes.

The New York, Pennsylvania & Ohio is going to introduce the block system on the single track line between Geauga Lake, O., and Mantua, 11 miles.

It is said that nearly all of the conductors on the Pennsylvania lines (west of Pittsburgh) who have recently received "blue envelopes" were not discharged for suspected dishonesty, but for drinking too heavily while off duty,—*Exchange.*

The drawbridge of the New Orleans & Northeastern over Lake Ponchartrain, near New Orleans, was run into, April 19, by the United States Government tender "Grover," and was tilted over so as to block traffic two or three days.

A St. Louis paper states that the new agreement between the Mobile & Ohio and its trainmen provides for a rate of two cents per mile, and 15 cents per hour for overtime for brakemen, and three cents per mile, and 20 cents per hour overtime for conductors. This applies on the whole road.

Two men were killed by the fall of an iron bridge in process of construction at Poplar Bluff, Mo., last week. It is said that the fall was caused by floods. The footwalk of an old highway bridge in Springfield, O., fell under a load of sightseers on Sunday last, and over fifty people fell about 12 feet into a canal. All of them were injured, four fatally. It appears that the bridge had been condemned as unsafe.

The suit of the Pullman Palace Car Co. against the state of Tennessee was decided in favor of the company at Nashville this week by the United States Circuit Court. The Legislature passed a bill taxing sleeping-car companies doing business in Tennessee $3,000 per annum. The court held that the law was unconstitutional, because the tax was exorbitant, and applied to sleeping-car companies alone, and not to railroads and individuals running sleeping cars.

A correspondent of the *Station Agent* says that the passenger conductors of the Missouri, Kansas & Texas have had their salaries increased $25 per month coincidently with the announcement of an order that they must furnish bonds. The correspondent, who is a station agent, thinks the same rule would apply with great appropriateness to his department. He says, however, that the station agents in Kansas now have to pay annual fees to their bondsmen of about one-third less than was charged for the same protection three years ago.

An excursion from Boston to carry a party of land buyers to Cardiff, Tenn., which started Saturday last, consisted of nine trains, each one of which was made up of one baggage, one dining and four or five sleeping cars. The route was over the Fitchburg; West Shore; New York, Chicago & St. Louis; Cleveland, Cincinnati, Chicago & St. Louis, and the Cincinnati, New Orleans & Texas Pacific. The trains were started 15 minutes apart, and were scheduled at 28 miles an hour over the Fitchburg, 26 over the West Shore, and 29, 30½ and 27¾ miles per hour over the next three roads respectively, these figures including stops in each case.

Chinese Railroad Projects.

The more recently published reports of Chinese railroad projects have been very conflicting. Various reasons have been assigned for the abandonment of the different proposed roads, religious scruples of the Chinese in connection with such decided and revolutionary innovations as railroads having been most prominently mentioned. From apparently trustworthy advices, however, given in the *Ostasiatische Lloyd*, it would appear that the whole question resolves itself into one of capital, or, more specifically speaking, of Chinese capital, since foreign influence and financial aid is not to be tolerated in the building of whatever Chinese railroads have been proposed. The Governor-General of Canton, in discussing the railroad policy of China, makes the point that only native capital shall be employed in building and developing the railroads of the country.

This is practically synonymous with indefinite postponement of railroad building in China since the imperial treasury is completely exhausted, and Chinese merchants are anything but favorably inclined to invest their capital in something in which not even a beginning has been made. This, at least, is the drift of a report which has, on request, been submitted to the government by the Chinese Admiralty. According to this report also, at least 10,000,000 tael (about $12,000,000), would be necessary to make a satisfactory beginning in the construction of the proposed Peking—Kan-Kan road. A loan of this, or for that matter even a lower, figure is discouraged, and it is held that China can better afford to wait until this sum has been accumulated than pay the interest which a loan would entail. Under these circumstances reports of foreign capital investments in Chinese railroad projects should not be accepted without reserve.

A Telpherage System for Mail Transportation in South America.

What would appear to be a form of telpherage system is at present being considered as a means of transporting mail matter between Buenos Ayres and Montevideo, in South America. Postal communication between the two cities is now maintained by way of the Plate river, but the service is necessarily slow and full of delays; whence the proposed scheme, which provides for what is really a small overhead electric railroad, the electric current passing through the track and from this to a small motor attached to a cigar-shaped vehicle containing the matter to be transported. The distance between the two cities is about 180 miles, and, in view of the very high speed at which it is proposed to work the electric road, would be covered in about two hours. The project is said to call for comparatively little capital.

Must be Very Moderate Drinkers.

Most legislative acts have to be interpreted by the courts before the precise nature of their provisions is universally understood. The following item, clipped from an exchange, indicates a similar condition on the Philadelphia & Reading Railroad:

"The order of Presdent Corbin against drinking by employés, which is only the restatement of an old rule of the company, has received an interpretation from Superintendent Paxson, of the Main Line, that robs it of many of the terrors with which it has been invested. Being asked to explain just what constitutes frequenting saloons, which is forbidden to the men while off duty, he replied: "A frequenter of a drinking place is not one who only visits a saloon once or twice a month, but one who is continually there. If a man goes into a drinking place every day that is, of course, frequenting a place." Being asked if it was the company's idea to have its men Prohibitionists or temperance, he answered: "The company wants temperate men. That does not necessarily imply Prohibitionists." The bosses in the company's shops at Reading have been instructed that no employé is to be discharged for drinking when off duty, unless he does so to excess, or is constantly at a saloon, and that the company does not want its men to leave its shops at noon and go to the saloons for beer, as many have been doing. One man has been discharged at Reading for this practice.

The Water Supply of Tokio, Japan.

Adolf Schwarz, a German engineer, recently contributed to the *Wochenschrift des östere Ingenieur und Architekten Vereines*, some interesting particulars relating to the water supply of Tokio, the capital of Japan.

The first operations in connection with securing a water supply for the city, date back to the year 1620. The water was taken from three ponds west of the city, discharging into a canal from which a large number of wooden pipes led to the various points to be supplied. A second canal was built in 1652, the two systems having been designed for supplying about 400,000 inhabitants. A third system finally was put in operation in 1882.

The distributing pipes are, in general, of wood, and of various shapes. Where the internal diameter is under ½ inch the pipes are made of hollowed-out round logs; where larger diameters are used, square section logs are employed. Stone conduits also are used. The total length of the latter is about 46 miles, while the wooden pipe system comprises about 96 miles. The pipes are laid at depths varying from 4 to 17 feet. The life of the wooden pipes varies from 10 to 20 years, according to the character of the ground in which they are laid. Where there are appreciable changes of level and direction in the pipes box-like cisterns are employed into which the pipes are laid.

The water instead of being supplied directly to the houses is led into wells, which, as a rule, are located on only one side of each street. These wells are sheathed with boards, held together by bamboo strips, so that they form, practically, a number of cylinders placed one above the other. The uppermost of the cylinders projects about 2½ ft. above the surface of the ground, so as to prevent accidents. There are now altogether 7,765 of these wells in various parts of the city. High-pressure in the distributing systems is avoided by leading discharge pipes into the ship channels.

A part of the water supply of the city is also obtained from a large number of artesian and common wells.

Horse Car Lines in London.

From some horse car line statistics, published in a German paper, we take the following figures relating to horse car lines in London. There are at present eight companies with the mileages given below:

North Metropolitan Co.	41 miles	Double Track.
London Tramway Co	19.63 "	Single Track.
South London Co.	5 "	" "
London Street Co.	12.50 "	" "
North London Co.	12 "	" "
South London Co	13.50 "	" "
Southwark and Deptford Co.	6.50 "	" "
West Metropolitan Co.	8.25 "	" "
Total	118.38 miles.	

Statistics of Railroad Labor.

Carroll D. Wright, the Commissioner of Labor, has submitted to the President, for transmission to Congress, his fifth annual report. The single subject treated is railroad labor. This report shows that on June 30, 1889, the whole number of railroad corporations in the United States was, approximately, 1,718, and the mileage of these roads, approximately, 156,400 miles. The number of persons employed on all the railroads of the country on that date was 689,726—the trainmen numbering 135,580; switchmen, flagmen and watchmen, 31,896, and other employés, 522,250. For the purposes of investigation, the railroads of the country were divided into seven geographical groups, in which the general conditions of labor were of a like character. Sixty railroads were selected, representing all parts of the country and all conditions of railroad labor. Connected with the sixty roads under investigation, in these several groups, there were 241,910 employés.

Upon investigating the subject of the relations of employés and corporations, which was extended to about 600 corporations, it was found that 377 companies prohibited the use of intoxicating liquors. The rest either have no rules relating to the subject or have modified restrictions. Nineteen roads maintain beneficiary institutions and some pay hospital expenses. A fair share of the roads assist their employés in securing life or accident insurance. Six companies pension their superannuated employés and also their permanently disabled people, and 266 companies retain in their service permanently disabled employés on light duty, the number of such on the rolls at the close of the year 1888 being 3,121. Many roads also provide some system of technical education for the men in their shops. A considerable number of railroads maintain libraries and reading rooms, and nearly all of the principal roads contribute toward the support of the railroad branch of the Young Men's Christian Association, which organization manages many of the reading rooms.

Commissioner Wright discusses at some length what he believes to be the absurdity of the common law rule, prevailing in Europe and America, which prohibits an injured employé from recovering damages from his employer when the injury is the result of negligence or unfitness of a co-employé. England, Alabama and Massachusetts have enacted laws providing that the defense of co-employment shall not be held as a good defense, while other states of the Union have in some degree modified the severity of the common law rule. The commissioner shows the tendency not only of legislatures but of courts to modify the harshness of the rule.

Wages.—The whole number of specified titles of occupations of the 60 roads investigated is 1,117. For purposes of treatment in this report, these are classified into 17 occupations. The report shows the facts outlined for 241,910 employés. Of this number, 224,570 are employed on specified time, as by the day or by the month. Of the 224,570 employés involved, 56,404, or over 25 per cent., are employed 25 days or less out of the whole year; 31,024, or nearly 19 per cent., are employed from 51 to 100 days; 42,719, or 19 per cent., from 301 to 365 days; and 5,557, or 2.2 per cent., work more than a full year.

Over 73 per cent. of the men are paid at rates ranging from $1 to $2 per day. The average daily rate of all the employés paid by specific time on the 60 roads is $1.64. Of the whole number of employés, 101,905 earn less than $100 per year; 53,621 earn from $101 to $200 per year, and 21,517 earn from $201 to $300 yer year. The average earnings per capita on all the 60 roads per year is $243, although less than 60 per cent. of all earn less than this average.

The report shows the average daily rate of pay in each of the seven groups of 17 occupations. The average for baggage-masters is $1.63; brakemen, $1.78; locomotive engineers, $3.22; telegraph operators, $1.43; conductors, $2.77. A comparative table is given as to the wages paid railroad men in this country and in Great Britain. This table shows that the average daily pay of locomotive engineers in Great Britain is $1.46, of firemen 91 cents; conductors, 97 cents; switchmen, in Great Britain, 85 cents; in the United States, $1.50; flagmen, in Great Britain, 81 cents; in the United States, $1.13. The report further shows that 224,570 individual men were employed on an average 147 days each; and they received 8243 average actual earnings for the year employed. These 224,570 men were employed to fill 105,807 places.

A Texas Station.

Mr. E. L. Barcroft, Freight Agent of the St. Louis, Arkansas & Texas, at Corsicana, Tex., writes in *The Station Agent* an account of the workings of his station, from which we print some extracts below.

Corsicana is not a terminus for trains, except for a branch 42 miles long. All trains arriving within the yard limits are under the control of the yardmaster, and he under the agent. A time tracer and memorandum way-bill is sent with every car, the document being numbered the same as other billing, but in a different series. Regular way-bills are sent by "registered" mail. Great care is taken in checking freight. Cars unloaded by consignees are as carefully checked as those handled at the freight house. All bulk cars arriving are weighed before being placed for delivery. The writer continues: On all less than car load shipments going to connecting line we take a joint check and as an invariable rule transfer these shipments from our cars to that of connecting line. After the yard men have weighed all bulk cars for points on connecting line and the clerk has stamped the weight on the way-bill or transfer sheet, the agent of the connecting line is notified to send a clerk to check the seals. These bulk cars are then placed on the transfer track and the joint check of the transfer clerks are taken on the seals. In taking a receipt for bulk freight it is done by seals and not by number of packages or of car contents. Should a car arrive at the station without a seal, we check the contents of the car and then take a receipt for the contents. This freight is transferred, if necessary, to obtain check. Freight is not received or delivered without a careful check. We have a chief clerk who has absolute control while the agent is not at the station, and in matters of accounts he is held responsible altogether. All clerks get their instruction from the chief, the agent looking more particularly after the outside working of the station. I have the accounts of the station balanced each day with as much care as any bank. The cashier shows each day the actual cash balance on hand and what it consists of, and, while this requires some little extra time and work, I find that it pays. On delivery or receipt of bulk cars to or from connecting line we always consult car inspectors as to condition of the car before delivering or receipting for the same.

Publicity of Railroad Accounts.

"We have spent new money only when it seemed urgently necessary," says the Chicago, Burlington & Quincy report, while out of nearly $5,000,000 spent in construction of roads and for equipment only $20,000 was expended in Iowa. "It may be supposed," continues the report, "that what the railroads lose other people gain; but a little consideration shows that the only commerce which can last is that which enables both sides to make a profit." In this sentence President Perkins states clearly the fallacy under which the average Western legislator seems to labor—that what is taken from a railroad is given to his constitutents. In the long run both parties to a bargain must make a profit if the trading is to continue.

This report is conspicuous among those of our great systems by its lack of details. No train mileage, no tonnage mileage is given; no statement of the respective percentages of the different classes of grain, coal and merchandise is made. Investors are entitled to know about the operation and resources of their property. It is not a question of distrust of the management, but one of pure business. Such a report as that of the Chicago & Northwestern is in marked contrast in these respects. It would be well if the New York Stock Exchange, as a requisite to listing, should demand monthly or quarterly statements of earnings, gross and net, and complete tabulated statistics once a year. In no other way can an investor tell whether his dividends come from bond sales, from the neglect to make necessary expenditures upon road-bed or cars, or from honest operation.—*New York Evening Post.*

Pay More Attention to Small Matters.

We have often wondered why every passenger car did not have in some conspicuous place a word or two which would designate the location of the toilet rooms for ladies and for gentlemen. In some of the best modern day coaches separate toilet rooms are provided, but so near alike in appearance are the ends of the car that the passenger has only one way of knowing at which end the right toilet room will be found, and that way is to walk to one of the rooms and see for which sex it is intended. A single word on the transverse partition at each end of the car, where it could be seen by all, would be sufficient to prevent a mistake and the embarrassment which naturally follows. On sleeping cars it is just as necessary to make some provision of this kind, and the word "gentlemen" or "ladies" could be placed over the passage way through the partition which separates the main portion of the car from the various rooms and closets at each end.—*Railway Review.*

Extravagance Down South.

A Georgia paper is astonished at the activity of the æsthetic department of the Central of Georgia, and prints the astounding information that a force of 21 men with a gravel train is at work at Midville, and that the company will have at that place a park in which 1,000 rose cuttings will be set out. This does look rather extravagant, we confess, but it does not appear whether this large force of men remained in Midville two hours or two months. We will hope that the train was merely stopping for water when the reporter happened along. If the above figures are correct there would, however, be only 47/10 roses to be set out by each man, so that the expenses of the gravel train may not have to be charged to construction account after all.

Commission Paying is Prohibited.

Mr. Rinearson, Assistant General Passenger Agent of the Erie, is sending to all ticket agents in his territory a handsome pocket knife, with the name of the road on one side and that of the agent on the other.—*Exchange.*

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At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

We have so recently written on the subject of standard rail sections that we shall say no more now than to call attention to the material collected in another column. It will be noticed that the preponderance of opinion, so far as collected there, is in favor of putting off the actual determination of standards until more can be known about the recent sections. To be sure, we have so far the opinions of but very few men, and the committee may bring to light an unsuspected mass of opinion in favor of fixing standards at once. We call especial attention to the suggestion of one of our correspondents as to standards for drilling the splicebolt holes. This is a matter that has received little attention, and that could probably be much more easily settled than the standard sections, and it is an essential feature of the scheme for uniformity. At least it is essential to the greatest mill economy.

The rate situation west of Chicago looks decidedly unpromising. Perhaps the most important piece of news connected with the passenger situation is the reported intention of the Burlington to put on a fast train, leaving Chicago at 1 p. m., and arriving at Denver at 6:30 p. m. the next day. This shows that the ruling powers as well as the ticket agents are getting interested in the fight. The proposed train is some three hours faster than the fastest now running, which goes via the Northwestern and Union Pacific, and it will only spend one night on the way instead of two. It is, we believe, more than two hours faster than was the corresponding Burlington train two years ago. If that train failed to pay, there is still more reason to suppose that this one will; for the conditions of population can hardly have changed so much in two years as to make a radical difference in this respect. Altogether, this is a most serious piece of evidence that the Burlington people are thoroughly in earnest in the present contest.

The rise in the price of iron, which a short time ago threatened to be so marked, seems to have come to an inglorious end. To purchasers of railroad supplies this is, on the whole, very good news. Their financial affairs are not in such shape that they could well afford to pay inflated prices just at present. The collapse of this "boom" was the inevitable result of the conditions under which it started. There was no exceptional demand for iron for industrial purposes. There simply happened to be a temporary shortage in ha am ounts available in the market. Prices began to go up. Everybody feared that they were going a great deal higher, and hastened to lay in somewhat larger stocks than he would otherwise have done. For the moment this increased the stringency, but a reaction soon made itself felt. At the old prices the demand and supply for industrial purposes were about equal. At the new prices the industrial demand was checked, and the men who had loaded themselves up at the high prices found themselves with unnecessarily large stocks on their hands. Such seems to have been the state of affairs most recently. It illustrates the truth that mere mercantile conditions cannot produce more than a temporary flurry in prices, unless there is a special demand for iron in railroads, shipbuilding and machinery. In the first two, at least, this condition did not exist; hence the quick reaction against the temporary high prices.

The committee appointed by the Master Car Builders' Association to recommend the best material for brake shoes selected a place for the tests to be made. It is on the South Chicago branch of the Rock Island very near the South Chicago stations of the Fort Wayne and the Lake Shore roads. The track of the Rock Island at this point is level, with a slight incline, sufficient to get a start to get up speed. The track is ballasted with slag, and is in fine condition. These tests will be made about the middle of May. The work of the committee has been progressing continually since the first meeting last fall, and it now has on hand a large amount of material from the shop tests which promises well. The Burlington dynamometer car has been fitted up with apparatus for making the records of the tests, as illustrated in the *Railroad Gazette*, Jan. 24, 1890. The series of road tests will be rather extended and will occupy as much as six full days and perhaps more, depending upon the number of repetitions necessary to obtain a fair average of results. The members of this committee are well known to be thoroughly expert men, and, whatever they do, all feel confident will be done well. Already the preliminary tests have indicated that the appointment of the committee was a wise step which will result in actual pecuniary advantage to railroad companies that see fit to follow out the recommendations of the Association.

As the time for the conventions draws near we receive suggestions for the improvement of the work of the Master Car Builders' and the Master Mechanics' Associations. Much of the two weeks of the conventions of these two Associations is lost in diffuse and pointless discussions. Several remedies have been suggested. One is the consolidation of the Associations. For this there are excellent arguments. The two weeks now consumed by those who live any distance from the place of meeting (as most members do) could be shortened to one, and the opportunities of meeting other men would be increased rather than diminished, for as it is many men can attend but one of the conventions. The convention could meet in chapters, with a fixed programme, and really more time could be given to the discussion of any one topic than is given now. That is, topics of a certain sort could be discussed in one room, while others were being discussed elsewhere, and every man could choose the subjects that concerned or interested him most. All of this we considered at some length last August. The matter is important and worth serious consideration; we doubt, however, if it is possible to bring about any such sweeping change in organization. Indeed, we are not sure that it is desirable. There is, however, a change in the convention work that might easily be made, to which there is no serious objection, and which would do a good deal to raise the quality of the reports and papers and discussions. That is, the reports and papers might be put in type and distributed in proofs before the conventions. This custom is followed with good results by other societies. The members who received the advance proofs would come prepared for intelligent and pointed discussion, such as very few men indeed can get up on the spur of the moment.

The Interstate Commerce Commission on Cotton Rates.

The decision of the Interstate Commerce Commission in the cases of the New Orleans Cotton Exchange against the Illinois Central and the Cincinnati, New Orleans & Texas Pacific is for the most part unquestionably sound; but there is one principle announced which will probably make trouble before long. It relates to the difference in rates between compressed and uncompressed cotton. The opinion is "that the rail carriers engaged in interstate carriage of cotton can, for the present, find no better or fairer rule than that the difference in the rate between compressed and uncompresssd cotton should be the actual and necessary cost of compression. This rule gives the shipper the benefit of the lower rate to the exact extent of the expense he has incurred in the necessary packing of his freight by a compress for the long haul, and to the carrier it gives the benefit of the additional space in the cars on freight thus prepared. The difference in the rate upon the two classes of freight, compressed and uncompressed, is, in this way, in substance, reasonably and justly accounted for in the difference in the rate charged each respectively."

The intention, obviously, is to put both classes of shippers as nearly as possible on an equality in their attempts to reach the market. The same tendency has shown itself in all the recent decisions of the commission, and is, in general, sound. But there is danger that it may stand in the way of good railroad economy, and therefore of good public economy. Suppose, for instance, that the cost of carrying compressed cotton on a long shipment is 20 cents a hundred pounds lower than that of carrying it uncompressed; while the actual cost of compression is only 10 cents a hundred. It is obviously good public economy to have the cotton compressed. The total cost of compression and haul in the one case is 10 cents less than that of haul alone in the other. But the effect of the present decision would be to deprive the public of the benefit of that economy. If the railroad is compelled to put a man who uses less perfect methods on a commercial equality with his competitor who uses better ones, most of the incentive to improvement is taken away.

In the present case the danger of harm is much lessened, because the railroads can, and in many instances practically do, refuse to transport uncompressed cotton on long hauls. But there is much reason to fear that this decision may be cited as a precedent in cases where the railroads have no such protection available. Such precedents are multiplying pretty rapidly. The tendency in this respect to-day is very different from what it was a few years ago. At that time traffic economy counted for everything and rights of small shippers for almost nothing.

Allowance for quantity was in those days carried to such an extent as to cause great indirect harm to the railroads themselves. The short-haul principle was not only disregarded; it was outrageously disregarded. Yet all this evil had a good side to it: and we must take care lest, in destroying the evil, we kill the good also. The good side of the system was that it promoted efficiency and economy. Under it we learned to handle masses of freight in the most advantageous way, and made reductions in rates to an extent which would have seemed impossible twenty years ago. The effect of the Interstate Commerce law is to take away the power of developing masses of business. We cannot search for advantageous ways of doing business, and give special rates to those who are in a position to enjoy them. Enterprise is sacrificed to uniformity. The whole system must move at the pace set by the weaker members. This is, we admit, a one-sided picture. The good obtained from increased equality in recent years outweighs the evil. But the evil, as far as it goes, is a real one; and every decision which limits the power of the railroads to encourage economical transportation methods increases the danger from this quarter.

American and English Locomotives.

I.

Comparisons of the efficiency, economy and durability of American and English locomotives have an interest for a few people who buy or sell them in markets foreign to both countries. This is the practical interest. They have also an interest to that class of minds that loves an wrangle over questions that in the nature of things can never be finally settled. This is the impractical interest. Very much of the discussion of the subject is by the latter class of people, and because of its inevitable inconclusiveness we seldom take a hand in it. Recently that thick-and-thin champion of English industries, *The Engineer*, has reprinted our editorial on "Design of Locomotive Details" (*Railroad Gazette*, Feb. 28, 1890), and expresses some surprise that an American journal should so frankly tell the defects of some American locomotives. We question if the surprise is real, for the *Railroad Gazette* has always freely criticised American practice, and probably always will, being confident that in that way it will not only promote good railroading, but help American industries as well. It seems desirable, however, that we should state again some of the reasons why a comparison of American and English locomotives must be inconclusive, and why we think that, for the service demanded in the United States and

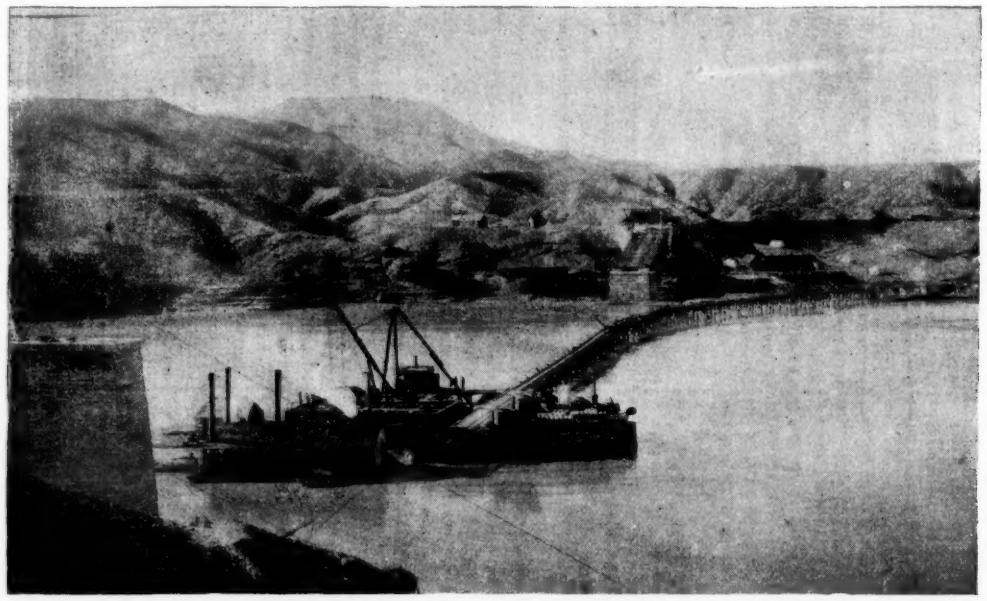


Fig. 3.—General View of Site, Looking West.

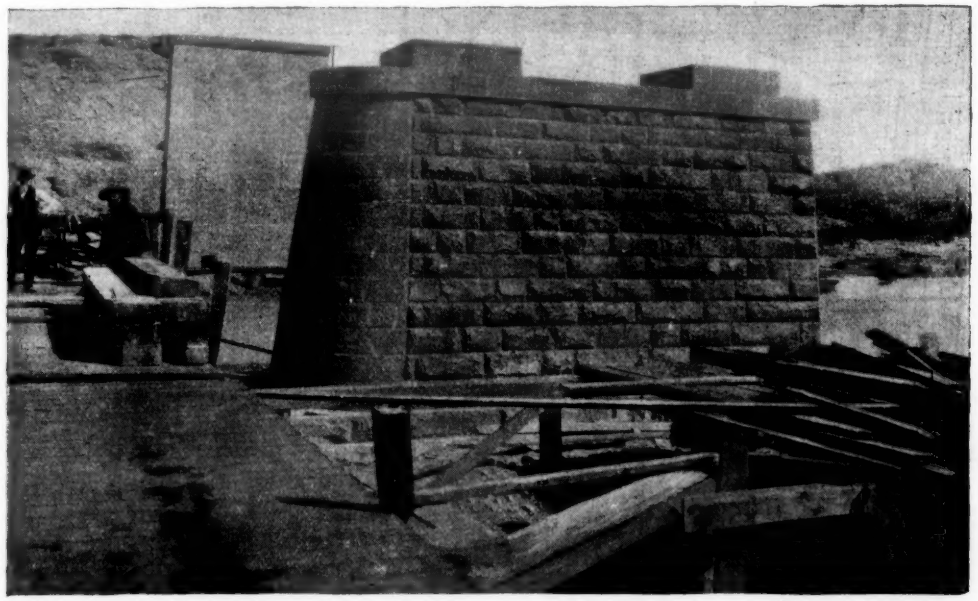


Fig. 4.—West Main Pier and Concrete Anchor-Pier.

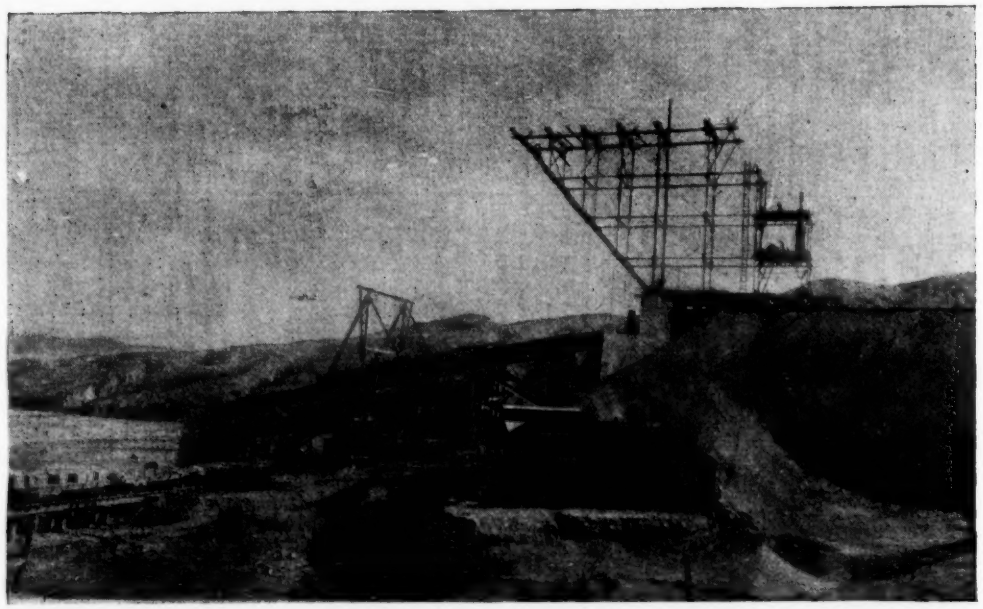


Fig. 5.—False Work for Shore-Arm of West Cantilever, Showing Traveler in Position.

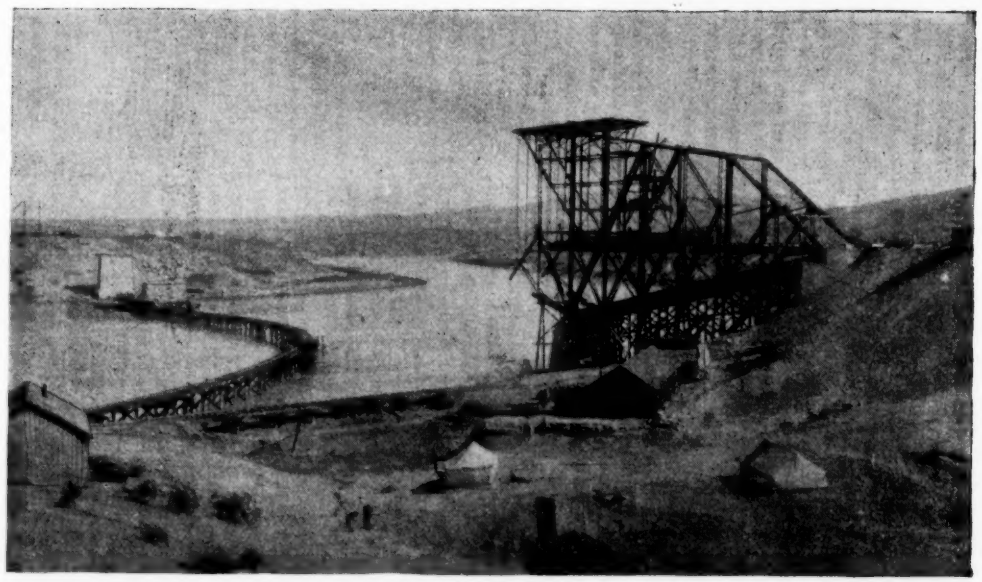


Fig. 6.—Shore-Arm of West Cantilever in Course of Erection.

VIEWS ILLUSTRATING PROGRESS OF WORK AT THE NEW ATLANTIC & PACIFIC CANTILEVER BRIDGE OVER THE COLORADO RIVER AT THE NEEDLES, CALIFORNIA.

for similar service in other countries, the American locomotive is immensely superior to the English.

The Engineer will agree with us as to the difficulty of comparing the two. Referring to heavy locomotives, that journal says:

If we required them, we could build them. When American engineers boast, as they do now and then,—but, of course, rarely [a certain great American would have said "this is sarkasm"]—about their goods engines as compared with ours, they forget that what they are really comparing are not two locomotives, but two systems of working goods traffic. Into this kind of controversy it would be profitless to enter.

The only conclusive settlement of the question, if one need be made, could be got by running English and American locomotives in the same service *when designed for the same service.* It is utterly useless to compare the performance of American locomotives on American roads with that of English locomotives on English roads. Neither would it be just to take American locomotives on English roads, or English engines on American roads, unless the engines were designed for the work to which they were put. The conditions which bring about a fair comparison of the two makes of engines are most nearly obtained in countries foreign to both the United States and England. In Australia, South America and Japan, particularly, are opportunities afforded to make comparisons, because the English and the American designers have been called upon to meet the same demands. We have seen the American locomotive, although handicapped by our tariff, largely sold in those markets, while in Canada, where like conditions existed, it long ago ran out the English locomotive entirely.

To attempt to compare the load hauled per ton of coal burned in the fire-box in the United States with the American engine with the figures obtained from English engines on English railroads is not only unsatisfactory, but absolutely illogical even provided the figures furnished were correct. It is not reasonable to suppose that a heavy locomotive, designed to haul heavy trains over roads frequently in bad surface and line, with hard grades and many curves, and making frequent stops will show the coal economy that may be expected from locomotives which are lighter, which have less loads in proportion to their weight and capacity, and which work on roads which have been years in developing to high perfection, and where from good signaling and the absence of level crossings stops are few. Similarly, in comparing cost of repairs it is impossible to get like conditions. In "repairs" are included more or less of costs of renewals, new locomotives to fill old numbers, repairs to buildings, tools used for construction, and material that is foreign to the question. One of our energetic roads has determined to keep an *accurate* account of locomotive repairs, commencing soon, and we venture to say that this will be the first case of the kind on record, either here or in England, unless it be a small road having but few repairs to make. When this information is procured, we shall be prepared to make comparisons with information on the same subject, if equally reliable, from other quarters of the globe, and not until then.

We may develop a little further the difficulty of comparing work done under the two systems. Any one who is familiar with English railroad practice knows that when a freight train starts from a station it can, for reasons mentioned above, keep going without stops between stations. There are other reasons why fewer stops per train mile are made, particularly in the case of through freight trains, which will readily suggest themselves. The amount of fuel required to start a heavily loaded train from a standstill is sufficient to keep it going for several miles, for two reasons: One, that the actual amount of foot pounds of work required to get a heavy train into motion is enormous; the other, in starting a heavy train, the fires are badly torn to pieces and much coal is wasted by the force of the exhaust. Take a train of 50 loaded freight cars or 4,500,000 lbs. This is not a maximum train; one on the Pennsylvania recently consisted of 85 cars. The work required to get this assumed train under way at 40 miles per hour, over and above that due to friction, is 243,000,000 foot-pounds. This would move this same train on a level track about three miles. This does not include the additional loss resulting from the action of the heavy exhaust on the fires or the loss due to working the cylinders almost full stroke. If one now compares a heavy freight train moving out of Chicago toward the west over a line of road that is crowded with traffic, with many railroad grade crossings, and which, owing to its great length, is difficult to keep in first-rate line and surface, it will be readily seen that the coal consumed per unit will be greater, or ought to be, than with an English train having a free right of way, moving over a roadbed that has been for years kept in the most excellent condition.

There is one point with reference to a comparison of locomotives of different capacities which has not been taken into consideration, and never seems to be sufficiently appreciated. It is the relative amount of heating surface per ton of load hauled. It stands to reason, in view of the fact that locomotive fires are always driven beyond an economical consumption of fuel per square foot of grate per hour, that the larger the heating surface and the grate per ton of load hauled, the more economical will be the locomotive. In this country, with new locomotives of great capacity, much difficulty is found in securing sufficient heating surface and grate area to give a locomotive which will work with the same economy as the lighter engines in which those parts are larger in proportion to the work done. In comparing English and American engines this should be taken into consideration. English railroad traffic does not demand as heavy locomotives as those used here, and as a consequence one will find by comparison that, for every horse power developed, the heating surface in our heavy engines is less than in the English, whereas some of our lighter engines of equal capacity with the English have more heating surface per horse power. When such differences as these exist, it is folly to attempt comparison. But when English and American locomotive builders are called upon to design for identical service on the same roads, as in foreign countries, whatever be the designs that are sent to compete, they might with some degree of reason be compared, because both the American and English engineers are supposed to know which of their locomotives is best adapted for the class of work to be done, and if one makes a choice of a lighter engine than the other, or an engine having less heating surface than the other, and such engine fails, it goes to show that the successful engine is built by manufacturers who better understand the construction of locomotives in general.

The reasons ought to be clear from this why, when put to the same work of hauling heavy loads on grades, in colonial countries, the American engine promises better and is by many colonial buyers declared superior. It is a type which has been developed under conditions quite like those which exist in such new countries, while, to the contrary, the English locomotive has been the outcome of service under an entirely different class of conditions, which have remained nearly constant for a long time.

The Engineer, in commenting on the editorial before mentioned, calls the attention of colonial purchasers to our criticisms of defective design and construction in American engines. If the writer were well informed as to the exacting character of our railroad service, and if he had known to what extent superintendents of motive power here are educated in all the many details and processes of locomotive construction, he would have known how hard it is to build to satisfy the high standard set by them. The "colonial purchaser" does know something of the requirements of railroad service in a new country, as shown by his frequent preference for American designs and workmanship. Here, where the standard is high, it is not surprising that builders have hard work to meet the demands of railroad men, who are continually spurred on by competition of parallel lines to seek the very best that can be procured. Locomotive performance is coming to be one of the most carefully watched of all the possible sources of loss in our railroad operation, and on our most progressive roads experiments are continually being made to determine the relative efficiency of the various types. It is this that has brought about the critical attitude mentioned in the *Railroad Gazette*, and this it is which makes it difficult for locomotive builders to keep pace with the improvements shown to be advisable. It is not surprising that colonial purchasers should look to us for examples when it is clear to them that we have still a new country, and our roads are built at low cost over undeveloped lands, where stations are few and far between, the water supply often abominable, and coal very expensive. The unprejudiced engineer, acquainted with the exact value of both the English and the American engine by actual experience with both, and such the colonial purchasers may be supposed to be, needs no argument to show him the advantages of the American engine for his work.

Colonial purchasers are a little shy of the English manufacturers of engines, owing to a tendency on their part to ship to the colonies all of the obsolete forms and types that happen to be in stock. We need not go beyond the files of English journals to prove this. Recently one of them called the attention of English manufacturers to this as a prevailing practice that would lead to a lack of confidence on the part of colonial buyers. In *The Engineer*, March 14, 1890, in an editorial, appears this:

But besides this, the drift of opinion among those who travel and who purchase steam engines is that English engineers do not build as good machines as those turned out of French and Belgian shops. The deficiency is not in design or material, but in workmanship and in the management of detail. It is not pretended that the English steam engine uses more coal than the foreigner. The objections raised refer to repairs, and interruptions and uncertainties of performance more than to anything else; and these are all due simply to want of accuracy and perfection of fitting.

Those colonial purchasers who are aware that many of the locomotive builders are also builders of stationary engines and machine tools will readily see the admission here made that the English makers, having had almost full control of colonial fields, have become so accustomed to doing rough work to increase output and profit that they are somewhat reckless. In a new country the need for machinery, even if poor, is so great that almost any sort of workmanship will pass: but as the country develops the tide turns, and, as now in some colonial quarters, English firms can no longer impose on the buyers of machinery. Regarding workmanship, we have nothing to fear in the case of a competitive trial, such as was suggested for Edinburgh this year. We have our ups and downs and our careless workshops. The bad workmanship, to which we have directed attention, is not universal or usual, by any means, and is not so bad as that on an English locomotive recently sent as a sample to the Western Railroad of France, which had to be nearly rebuilt after running a short time, because of poor workmanship. Again, the English compound sent to the Pennsylvania road is by no means superior in workmanship to the locomotives on the Pennsylvania road, whether built by the company or by contractors, yet this was a sample engine built on a special order at a large cost.

This machine has had one good effect in this country, in showing conclusively how different are the conditions of railroad service in England, and how much lighter the trains must be. In economy, by actual and carefully conducted trials, the English locomotive boiler has not evaporated more water per pound of coal than the engines of the Pennsylvania: when doing the same duty, in fact, it evaporated less. We say when doing the same duty, because the low capacity of the English engine prevented its use on regular through trains.

Regarding general shop practice, and the machine and engine business in general, this from *The Engineer*, March 14, 1890, in regard to English shops, is instructive:

There is far too much of what is forcibly enough called "slap dash" in many shops. Holes are bored to receive pins which ought to be a driving fit, but are not; surfaces meant to be flat are not flat; things that should be round are oval, that which should be straight is crooked. In many shops very large sums are spent to begin with on tools; but these are not kept up, and after a short time they turn out defective work. Some years ago a firm in a very considerable way of business, and with an excellent reputation, determined to work to standard gauges. The gauges were purchased and sent into the store, and they never came out of it; no use whatever was made of them. Another firm determined to introduce milling machines very largely, and did so with manifest advantage and profit. For the first six months all went well. After that the cutters did anything rather than work true. . . . There are firms, which have hitherto possessed a splendid reputation, who seem to have grown careless, and are content to live on the memory of the past. They will do well to take warning in time. . . . Smaller and larger defects in stationary engines are constantly brought under our notice, and it would be mistaken kindness to hold our peace, and say nothing about the matter. Our duty is to warn our readers in good time, and urge upon them more and more the imperative necessity of maintaining their reputation against the world. . . .

We have heard it urged that French and Belgian makers get larger prices than the English firms. Possibly this is true. That must be the fault of the English engineers, who do not take care that they will sell only what is good, and get its value; but if otherwise, then it is high time that the cause should be explained. Price certainly does not seem to stop orders abroad. One Belgian firm with a splendid reputation for stationary engines has at this moment orders in hand which will last them three years. Can any English house say as much?

We express no surprise that our contemporary should make such admissions of lax methods. It is only doing its duty in its accustomed way. Only when it feels obliged to warn "colonial purchasers" against the Yankee, its scientific zeal is overshadowed by its trade spirit. We shall return to this subject next week, and develop more at length some of the points briefly mentioned here.

The Bridges over Harlem River.

The discussion in Congress concerning the bill for the improvement of the Harlem River, by which it is proposed to add to the commercial facilities of New York City several miles of water front at which large vessels can be accommodated, and at the same time provide a short cut for vessels to and from Long Island Sound, which do business with points on the Hudson River, has led the railroads entering the city from the north to make a strong protest against the injury to their interests which would be involved in such a change. There are four railroad drawbridges across this river. That at Spuyten Duyvil, which is the one nearest the Hudson River, is used by the Thirtieth street line of the New York Central, over which the passenger business is comparatively unimportant. The next is that of the New York City & Northern at 155th street. This company has not, so far as we know, made any complaint. The third and most important bridge is that at Fourth avenue over which the enormous passenger traffic of the New York Central and the New York, New Haven & Hartford is carried. This bridge is only a few feet above high water, and even with the present limited water traffic its draw is open so much of the time that passengers are constantly complaining. Bills have been many times presented before the New York Legislature, looking to an abatement of the nuisance, and appeals to Congress for relief have been made before now. The argument, enforced by the story about a scow loaded with mud, moving at three miles an hour, having the right of way, while 1,000 passengers whose time is worth $100 a minute, are waiting in the cars, has become familiar to every one. This argument is a strong one, but the question of the jurisdiction of a state over a navigable water of this kind provokes so much discussion that all efforts put forth in the Legislature have come to naught, and to secure action on such a distinctly local question from such an unwieldly body as the National Congress is a slow process.

The enormous development of railroad traffic in the last half century has brought about a new state of things, and one quite different from that existing when the traditions embodied in our present laws were formed, and the change must sooner or later be recognized. The relations of the thousand passengers to the "dead" freight, which pays only a mill per ton per mile for its carriage, *are* different from those between a land passenger and a ship 100 years ago.

The position of the railroads in this case seems fair and conservative. There can be no question that public sentiment throughout the important territory east of the Hudson River, as well as that in a good share of New York state and other communities using the New York Central road, would sustain them, though New England vessel owners who do business with points on the Hudson River would of course object to any interference with their desire to shorten their voyages by 20 miles. President Depew, of the New York Central, in a newspaper interview, argues for a fixed bridge at Fourth avenue, which shall be 25 ft. above high water. This would practically restrict navigation to canal boats, barges and tugs, so far as that portion of the river is concerned. Presumably the plan is to adopt the standard of 25 ft. headway for the whole river, and Mr. Depew points out that New York still has a large unimproved water front along the Hudson, north of the territory now occupied by wharves. It would seem, however, that if the Harlem water front is urgently needed for the enlargement of the general commerce of New York city the Spuyten Duyvil drawbridge and the one at 155th street might be maintained while still permitting the change at Fourth avenue. The New York, New Haven & Hartford, which is vitally interested, though it owns no tracks on the island, has laid its arguments before the Massachusetts Legislature, with a view to securing the passage by that body of a memorial to Congress.

The Fourth avenue drawbridge must be abolished some time, for the delays and expense caused by it are already oppressive; so that whether the abstract question of the respective rights of railroad trains and water craft is decided or not, this special case ought soon to be settled. If a fixed bridge cannot be built, the railroad company will have to consider the feasibility of a tunnel. This has been discussed already, but, besides costing an amount very much larger than would be necessary for any bridge, the depression of the grade would involve a great increase in expense of operation for all future time, for the line of the road must surmount, in less than two miles from the river, the high ground at 100th street, which could be reached from a tunnel under the Harlem River only by a severe grade, probably 60 or 70 ft. per mile.

The most easterly drawbridge is that of the Suburban Rapid Transit (Elevated) Railroad, whose line is on a level with the Manhattan elevated street lines. This road could hardly afford to tunnel the river even if it had a traffic equal to its full capacity. Its present bridge is, however, high enough to admit of the passage of tugs and low craft without opening the draw, and the delays to trains are proportionately less numerous. This consideration would, indeed, apply to a draw in a high bridge at Fourth avenue.

The city itself should be cautious about encouraging any action tending to increase general water traffic for the street drawbridges are an important consideration. There are two important bridges of this kind now and the number must soon be increased.

March Accidents.

Our record of train accidents in March, given in this number, includes 67 collisions, 93 derailments and 11 other accidents; a total of 171 accidents, in which 44 persons were killed and 165 injured.

These accidents are classified as follows:

COLLISIONS:		
Rear	38	
Butting	17	
Crossing and miscellaneous	12	
		— 67
DERAILMENTS:		
Broken rail	4	
Loose or spread rail	9	
Broken bridge	1	
Broken wheel	5	
Broken axle	6	
Broken truck	1	
Misplaced switch	11	
Runaway train	2	
Hand car	1	
Unfastened bridge	1	
Cattle on track	2	
Ice	1	
Landslide	4	
Wind	1	
Accidental obstruction	3	
Malicious obstruction	1	
Purposely misplaced switch	2	
Unexplained	38	
		— 93
OTHER ACCIDENTS:		
Broken parallel or connecting rod	2	
Miscellaneous	9	
		— 11
Total number of accidents		171

The causes of collisions, where given, were as follo ws:

	Rear.	But- ting.	Crossing and other.	Tot'l.
Trains breaking in two	5	..	..	5
Misplaced switch	4	1	1	6
Failure to give or observe signal	2	..	1	3
Mistake in giving or understanding orders	..	5	..	5
Miscellaneous	12	1	2	15
Unexplained	15	10	8	33
Total	38	17	12	67

A general classification shows:

	Collisions.	Derailments.	Other.	Total.	P. c.
Defects of road	..	14	..	14	8
Defects of equipment	5	12	5	22	13
Negligence in operating	29	15	..	44	25
Unforeseen obstructions	..	14	4	18	11
Unexplained	33	38	2	73	43
Total	67	93	11	171	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other.	Total.	P. c.
Passenger	20	21	8	49	21
Freight and other.	107	72	4	183	79
Total	127	93	12	232	100

The casualties may be divided as follows:

KILLED.	Collisions.	Derailments.	Other.	Total.
Employés	17	18	..	35
Passengers	7	..	..	7
Others	2	..	..	2
Total	26	18	..	44
INJURED.				
Employés	49	42	4	95
Passengers	28	34	5	67
Others	2	1	..	3
Total	79	77	9	165

The casualties to passengers and employés, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road	..	10	2	5
Defects of equipment	..	3	..	9
Negligence in operating	7	44	22	53
Unforeseen obstructions and maliciousness	..	10	6	14
Unexplained	..	..	5	14
Total	7	67	35	95

Twenty-six accidents caused the death of one or more persons, and 41 caused injury but not death, leaving 104 (60 per cent. of the whole) which caused no personal injury worthy of record.

The comparison with March of previous years shows:

	1890.	1889.	1888.	1887.
Rear collisions	38	26	36	20
Butting "	17	11	26	22
Crossing and other collisions	12	1	3	3
Derailments	93	59	99	59
Other accidents	11	4	8	13
Total "	171	101	172	117
Employés killed	35	19	53	32
Others "	9	3	32	27
Employés injured	95	54	103	68
Others "	70	50	108	144
Passenger trains involved	49	33	75	46
Average per day:				
Accidents	5.52	3.26	5.55	3.77
Killed	1.42	0.71	2.74	1.90
Injured	5.32	3.35	6.79	6.84
Average per accident:				
Killed	0.257	0.217	0.500	0.504
Injured	0.965	1.029	1.227	1.512

The worst accident of the month, the collision at Bay View, March 6, has been fully discussed heretofore. The only passenger killed during the month, aside from the six victims of this collision, was one man in a rear collision, at Hall, Mont., on the 28th. He was in a caboose where he had been asleep. At the time of the accident he had just come out upon the rear platform, where he had ample opportunity to escape before the collision occurred, but it is supposed that he had not become fully awake.

One of the most alarming train accidents of the month is classed among "other accidents," as the accounts do not indicate that the train was derailed. It was, however, of a serious nature. We refer to the overwhelming of two passenger trains by a snow slide at Wheeler, Colo., on the 5th. A passenger train on the Canadian Pacific was derailed and completely overturned near Pembroke, Ont., on the 12th, two passengers being fatally injured, and a number more or less seriously. It is said that two of the cars were set afire from the stoves, but the extent of the damage done by the flames appears not to have been great.

There were only 17 butting collisions in the record for this month, but of these five, nearly one-third, are reported as resulting from mistakes in telegraphic orders. The fact that a considerable share of the "mistakes in orders" occur on roads which employ the duplicate order system affords unmistakable evidence that the trouble in this department is not so much a lack of system as of discipline in the enforcement of it. In the butting collision at Portage, N. Y., on the 22d, four employés were killed, but they were all on the engine, and attention is called to the fact that three of them were unnecessarily in that position, that is, it was not in the line of their duties. Both engineers and one fireman escaped with their lives. The company has since issued an order requiring a strict enforcement of the rules which prohibits others than engineers and firemen riding on the locomotive. The investigation of the causes of this accident has been quite thorough, but the exact way in which the error was made has not been clearly shown. It is believed the operator at Rossburg, who received the order, repeated it before writing it down. His repetition was correct, but the copy given the conductor was wrong. Of course nothing but a rigid system of inspection will provide against such deviations from instructions as this. It has been suggested that the numbers of passenger trains should be arranged in a series separate from those of freight trains, as, for instance, make passenger trains from 1 to 99, and freight trains from 200 to 300. This would provide an additional safeguard in a case like the one under discussion, and such a separation of numbers would be convenient in other respects, though there are some difficulties in the way of adopting such a change where an old series of numbers has been long in use, and there would be no benefit from it when an error involved two passenger trains instead of a passenger and a freight. The naming of engine numbers in orders would check this kind of error in a large degree. The New York State Railroad Commissioners, in their report on this case, recommend that operators be required to work not more than 12 hours, and that numbers of trains in train orders be spelled out.

Press reports during the past week have given considerable space to agitations among yard brakemen at Pittsburgh and various classes of employés on the New York Central. The threatened strike of carpenters and other artisans in the building trades seems to have incited the Switchmen's Union to similar action, though it is about as hard to discover any special reason for their asking higher pay just now as it is to find any rational cause for the builders' strikes. At Pittsburgh all the roads seem to be involved, though the smaller ones wait for the Pennsylvania to act before showing their hand. The dispatches are vague and contradictory, and it is not clear just what the men want, though the leaders talk mostly about reduced hours of work. The Pennsylvania officers apparently admit that an increase of pay is deserved and will probably grant it. The amount has not been definitely stated, though one account, apparently authentic, says it will be 20 to 30 cents a day. The officers and the switchmen have held numerous conferences, but the former announce that they have made a firm stand against recognizing officers of employés unions as such. The federation of different organizations seems to have had one good effect, in that it leads to delay for more careful consultation and thus tends to prevent hasty action. Some non-union men, including the passenger yardmen of the Pennsylvania, have taken the present occasion to appoint committees to present requests to the officers, and some painters of the Pennsylvania at Pittsburgh and carpenters of the same road at Philadelphia have struck for ten per cent. advance. The Pennsylvania seems to have placed a well-organized detective force on duty, not only at Pittsburgh but at other points along the line. None of the discontented men, except the painters, have left work, and the prospect seems to be that no general strike will occur. The New York Central men seem to have become excited over discharges of trackmen and some other laborers, made in pursuance of a sudden determination

on the part of the new head of the operating department to largely reduce expenses, and the dismissal of some trainmen in consequence of the introduction of a number of large freight engines in place of those of less capacity. Consolidation engines are a new thing on the Central. It does not appear that any of the men have complained to the officers, and there seems to be some ground for the assertion by the latter that the excitement is largely originated in the reporters' imagination.

A correspondent sends us an extract from the Boston *Herald* containing some "space work" written by some young "journalist," who apparently was sent out to a railroad yard to get materials for a romance. How long the entire article was we do not know, as our correspondent has considerately torn off a portion of it; but in the eight inches sent we find that locomotives, in the latitude of Boston, have their boilers washed out once in three months, and that preparatory to this the *foreman* of the roundhouse blows off the steam through the *whistle*. The main purpose of washing is to remove the sediment that may have settled in the *flues*. The cold water used for the periodic hydraulic tests of boilers is forced in by an inspirator. When a cold engine is being fired up the flames "roar merrily," but whether with greater or less hilariousness than is customary in ordinary working we are not told. We are given a liberal sprinkling of information about the "throbbing pulse" and the "snorting breath" of the locomotives, and so on ad libitum. The whole article bears the marks of a young reporter in his first attempt, and is similar to those being printed all the time in scores of papers all over the country, except that the Boston *Herald* is a little more reckless in its "padding" of this kind than is the case with most papers. The article is sent here by our correspondent evidently in the way of criticism of its ignorant statements, and its nonchalant way of conveying misinformation. He seems to think that if a newspaper sets out to tell a thing it should tell it correctly. We sympathize with this view, and are sorry, not only for him, but for every one who has to read the daily papers. Only last week the *Northwestern Lumberman* complained that newspapers in Chicago did not know the difference between lumber and logs, and that the average editor would be unable to distinguish between a marble quarry and a tombstone. But there is no help for all this. Newspapers have suffered so severely for telling out-and-out lies that they are making an honest effort to construct their articles in the miscellaneous department *chiefly* of facts. The only hopeful view we can take of the situation is to urge our friend to cultivate thankfulness that these articles are not bald fiction from beginning to end. Readers should band together and convey to the editors, with convincing thoroughness, the idea that blank paper or carefully written soap advertisements (with artistic outline drawings) would be preferable to the attempts of youthful reporters, who, we admit, must practice somewhere, but whose work should be more strictly confined to the back office. Every one must creep before he walks, but it seems a pity to exhibit the educational process to an unwilling audience; besides, it costs 50 cents a thousand ems to put the manuscript in type—a clear waste.

The Seattle, Lake Shore & Eastern has established a system of inspection and premiums in the roadway department similar to that in use on the Savannah, Florida & Western, Pennsylvannia and other eastern roads. A preliminary inspection will be made to determine the proper classification of the section masters of various degrees of capability. In addition to a cash prize, the successful contestants are to receive diplomas, and the foreman of the section which receives the highest average on the division will receive a blue board, which is to be set up on his section at a point designated by the roadmaster, on which will be written: "The best section on —— division," and is to be retained in the possession of that section until won by some other section at some future inspection.

The premium system is also to be extended to the train service.

"Beginning with May 1, all trainmen will receive monthly awards for highest standing, as shown by comparative average performances. The passenger train conductor showing the best average of time, most prompt attention to duty, least complaints from the general public, the most gentlemanly appearance and the least errors committed, will receive, in addition to his regular pay, $10 per month. Baggagemen and brakemen under him will receive $5 extra per month. The engineer of passenger trains showing the greatest care, least accidents to his train or detention at stations by oiling and other matters of that character, will receive $10 extra per month, and his fireman $5 extra. All men to receive these premiums shall have made 20 days or more time in the month. Continual low averages by passenger conductors will be considered a mark of incapacity and will result in their being reduced to freight train conductors. High averages will be considered a mark for promotion to higher positions. Freight conductors showing the greatest average of cars handled per train, least number of complaints from agents and shippers or other sources, and best management of train as detailed in performance sheet will receive the same premium as given to passenger conductors. Freight engineers and firemen making the highest marks as determined by their performances will also receive the same premium as passenger engineers and firemen. Size of engine and average number of loads handled will also be considered in making awards to freight enginemen. Promotion will be made in the following order: freight conductors to passenger conductors, freight brakemen to passenger brakemen, passenger brakemen to baggagemen, baggagemen to freight conductors. Yard switchmen will also be promoted to freight brakemen or to yard masters. Yard masters will be considered equal to freight conductors, and will stand in the same line of promotion."

In a recent issue we mentioned the fact that competitive trials of power brakes are to be made in the colony of South Australia. We have received particulars which warrant further mention of a matter which is exciting much attention in Australia. Victoria and New South Wales have for some years used the Westinghouse automatic on all passenger trains, but as a large number of mixed trains are run, and the ruling grades are very generally 100 to 130 ft. per mile, with some stretches of 176 feet per mile, the former colony has adopted the quick-acting brake for all freight cars, and 4,000 are now being fitted. New South Wales is about to make a competitive test of the Westinghouse against the most recent form of the Automatic Vacuum, a brake which, in an older form, is much used on passenger stock in England. South Australia has appointed a board of experts to test and report on the best brake for general adoption on both freight and passenger equipment. The chairman of the board is Mr. Grayson, an ex-master mechanic and member of the Legislature. Among the members is Mr. D. H. Neale, formerly connected with this journal, and now mechanical engineer of the New South Wales Railways. The board has determined to make trials with mixed trains of 50 cars, 47 of which will be four-wheeled "wagons" of the English type. The train will, therefore, be about half the length and about one-fourth the weight of the trains in the Burlington trials. The board has advertised, inviting competitors to fit trains for the trials, which take place in September next. The Westinghouse and Automatic Vacuum have already signified their intention to compete. Queensland is also understood to be contemplating the adoption of a continuous brake, and has recently given a trial order for the Westinghouse freight brake.

It seems at first sight somewhat strange that the cheapness of transportation by boat on Lake Superior should have a marked effect on the price obtainable for carrying merchandise on a north and south line of railroad in Idaho, yet such is the case. The Union Pacific, which takes freight to and from Montana points over the road in question, has to compete with the Northern Pacific between Chicago and Montana, and the rates by the latter route are materially affected by the very low prices now in force between Chicago and St. Paul. It is true that these Northwestern lines are sufficiently numerous to keep rates pretty low, even when the lake is frozen up, but yet the situation would probably not be nearly so bad as it is if competition were wholly confined to land lines. The Chicago-Council Bluffs lines were asked by the Union Pacific to assist it in meeting this competition, and they left the question to Chairman Faithorn, who has just decided that the request be granted. On all business received from points east of Chicago destined to Montana points it is proposed to apply the 30 cent basis to Council Bluffs as well as to St. Paul. To do this and still preserve the 60 cent basis on local traffic from Chicago to the Missouri River might be complained of as a violation of the the Interstate commerce law, but the Union Pacific has promised to relieve the Chicago lines from any responsibility on that score.

The troubles of the railroad officers, as of other people, in the lower Mississippi valley, still continue, the floods continuing and new crevasses opening every few days. The river began to rise Jan. 5, and at Vicksburg has been above the danger line for 83 days. The Louisville & Nashville is now the only through line east of the Mississippi that can run trains into New Orleans. The Illinois Central was overflowed last week, and is in bad shape for many miles. It had 30 cars of bananas left on its hands at New Orleans when the waters cut it off. Many train loads of stone were placed on the track in the flooded region to hold it in place, and bridges had to be anchored. At many small trestle bridges the stringers floated clear of the caps, and drift wood forced the track out of position. The track was not so badly submerged but that a hand-car could be run over it. On the Vicksburg, Shreveport & Pacific a great amount of work was done to protect the road bed, and at last accounts the whole line was passable. The Arkansas Valley route between Reedsville and Varner was submerged this week for the third time during the past five weeks. Trains have been abandoned south of Pine Bluff.

Mr. Allison D. Smith, Superintendent of Motive Power of the Victorian Railways, recently made an interesting experiment with the quick-acting Westinghouse freight brake now being fitted on the freight equipment. A train of 40 cars was made up of 20 empty cars next the engine and 20 cars laden with coal at the rear of the train. When running at speed down a grade, Mr. Smith pulled a pin, cutting the train in two at the rear of the 20 empty cars. It might reasonably be supposed that after the first separation the rear cars, having far less brake power in proportion to their weight and consequently to their momentum, would gain upon the front cars and run into them with some amount of shock, especially as all the cars were loose coupled. Mr. Smith, however, states that the cars never separated more than 12 feet, and then came together, separated a few feet, came together again, and finally stopped about 18 in. apart, the shocks being insufficient to throw him off his feet while standing in the rear empty car. This very satisfactory performance, under trying circumtances, would show that little damage is to be feared from breakaways where a quick-acting brake is used.

Omaha dispatches state that a contract has been signed by which the Chicago, Rock Island & Pacific and the Chicago, Milwaukee & St. Paul roads will run passenger trains into Omaha within the next 30 days. The contract covers trackage and other privileges in the Union Depot now in process of construction and joint use by the Rock Island of the Union Pacific tracks to Gilmore, nine miles south of Omaha. It is said that the Rock Island proposes to build from Gilmore to Lincoln, from which point it will use the Union Pacific tracks to Beatrice, thus connecting the Rock Island's main line with its Denver system. The Gilmore-Lincoln extension will be used jointly by the two roads. As the Chicago & Northwestern already has a close traffic agreement with the Union Pacific for through passenger trains, and as the Chicago, Burlington & Quincy already reaches Omaha by its line up the west side of the Missouri River from Plattsmouth, Council Bluffs seems destined to abandonment as a transfer station. The only eastern road not reaching Omaha will be the Wabash, whose line to this point does not do a heavy passenger business.

The thirteenth quarterly meeting of the C., B. & Q. Master Mechanics was held this month in the offices of the road in Chicago. The meeting was an important one, and a large amount of business was transacted. There was a full attendance. Such meetings as these bring together men who otherwise seldom meet each other, and the results are good in many ways. The men become accustomed to formulate and express their ideas clearly on topics of great immediate importance. The personalities of the different men come to be understood, and this materially assists in comprehending the exact meanings of letters, messages, and instructions received in actual service. By meeting the men in this way, and measuring the capacity of his subordinates, the Superintendent of Motive Power is enabled to express his orders in a manner that will appeal to each individual master mechanic.

The western shore pier of the Thames River bridge at New London, Conn., has settled somewhat, and the officers of the road have given out statements, going to show that it is a matter of trifling importance. The facts seem to be about as follows, so far as we can judge at present: The pier in question is the one supporting the last deck (150-ft.) span and first through (310-ft.) span. It contains about 425 cu. yds. of masonry. It is said to have settled about four inches (some say seven inches) and settlement appears to have practically ceased. There will be no interruption of traffic. It is not said, by those who know, that the pier will be rebuilt, but we are inclined to think that it will be. The pier stands on piles driven in gravel and sand. This alluvial deposit was found by sounding to be at least 50 ft. deep.

TRADE CATALOGUES.

General Catalogue of the Kilbourne & Jacobs Mfg. Co., Columbus, O. — This well-known firm manufactures scrapers, plows, mining and foundry barrows, contractors' barrows, farm, plantation and contractors' carts, and a considerable variety of similar apparatus. The firm claim to be now the largest makers in the United States of implements for handling earth. They have introduced pressed steel shapes with great success, applying them to scrapers, wheelbarrows, water troughs and a great variety of other purposes. An automatic front end gate attachment for use with wheel scrapers

is shown in the accompanying cut. This is entirely automatic in action and perfectly simple. It is bolted to the uprights from hangers on the side of the scraper by two bolts, and can be easily put on or taken off. By the use of it the load may be hauled over the roughest roads without spilling the material. The catalogue shows a very simple and cheap contractors' barrow with a pressed steel tray. These barrows have a special wheel with spokes tightened from the centre, keeping the tire always in place and the wheel tight. The tires are made

⅝-in. thick, of wrought-iron, and the spokes of steel ¼-in. x ⅝-in. The wheel revolves on a fixed axle, which serves as a brace between the ends of the handles.

The Magnolia Anti-Friction Metal Company announce that they will be glad to send to such of their friends and customers as desire it a copy of a romance entitled "Luxilla," which they have handsomely printed in a volume of 80 pages. Luxilla is a superlatively handsome maiden with supernatural, magic powers, and she is wooed by a feudal baron, "Count Ipsellee," whenever he can get a chance at her. There is nothing in the story to connect it with the Magnolia Anti-Friction Metal Company's business, or to suggest its use as an advertisement of their metal, unless it may be in the following paragraphs:

"There sat the Count upon a rock, at the edge of the forest, and so intently was he looking up the mountains, that he scarcely heard her light footfall when she was close behind him. Turning suddenly, Count Ipsellee, trembling all over, would have clasped her in his arms, but there was something calm, commanding, yet innocent, in her bearing, which prevented."

Her bearing was apparently anti-frictional, and ran cool in all interviews. On the other hand, the Count's bearing was frequently brassy, and ran hot as follows:

"Why dost thou trouble thyself about spirits, Luxilla? Come with me and be my bride; I love thee! exclaimed he putting his arm about her. She arose, freed herself gently, etc."

She never melted to the Count, and perhaps we find in this the moral which the Magnolia Company wish to convey to their friends.

TECHNICAL.

Manufacturing and Business.

Franklin Van Winkle, M. E., Consulting Engineer and Mill Architect, has established an office at 91 Liberty Street, New York City. He will make a specialty of plans, specifications, and the superintendence of all classes of mill construction and equipment, also of steam heating and ventilation.

The business of the late Edward P. Allis, of Milwaukee, Wis., has been reorganized under the form and corporation name of "The Edward P. Allis Company." William W. Allis is President, and Charles Allis, Secretary and Treasurer of the company.

The partnership heretofore existing between Daniel B. Ruffner, William Dunn and Gideon S. Bolton, under the name of Ruffner, Dunn & Co., of Philadelphia, has been dissolved by mutual consent. The firm has been reorganized by D. B. Ruffner and W. Dunn, under the firm name of Ruffner & Dunn, for the purpose of carrying on the business of manufacturing the Excelsior automatic nut locks, at Schuylkill Falls, Philadelphia.

About a year ago Pedrick & Ayer, of Philadelphia, moved into a large new shop on Hamilton and Buttonwood streets, west of Tenth. The building has a front on both streets of 40 ft., and a depth of 160 ft., and is two stories high. The structure was planned with a view of adding more stories, but the firm did not expect that this would be necessary for at least five years. But in less than a year it has been found necessary to enlarge the building, adding two new stories and putting in new tools. Since the new building was erected the old shop on Hamilton street has been used for repair work. This department is now to be removed to the new building. The draughting room will be removed to the third floor, giving greater space to the general offices on the second floor.

The Consolidated Car Heating Co. will remove its New York office on May 1 from 15 Cortlandt street to 115 Broadway.

The sales of engines by the Westinghouse Machine Co., of Pittsburgh, for March, amounted to a total of 91 engines, with an agregate horse-power of 4,205.

Catalogues and price lists of manufacturers of agricultural, mining and railroad machinery and material are desired by the Department of Public Works (Fomento) Managua, Nicaragua, C. A. Catalogues of machinery for extracting fibres known as "pita," sisal hemp, ixtle. henequen, manila hemp, etc., are especially desired.

The Giant Car Mover Co. was incorporated in New York State, April 19, and filed its charter at Albany, with a capital stock placed at $150,000. The company is to manufacture car movers, patented by C. L. Barnhart, of Flint, Mich., and John Penny Cook, of Milwaukee, Wis. The principal office is to be in New York City. Frank P. Marsh, Henry H. Prettyman, John T. Mitchell, Adolph Norden, Louis Engelhorn, John Whitmore and Clarence A. Blanchard are the directors.

The Birmingham Railway Supply Co. will soon start up the rolling mill removed from Nashville, Tenn., to Birmingham, Ala., over a year ago by the Elyton Land Co. The company will make bar iron, including bolts, nuts, fish-bars, etc.

The following companies have recently been incorporated in Illinois: W. H. Lehman Car Co., of Chicago; the capital stock is $500,000, and T. W. Harvey, G. L. Harvey and A. M. Tanner are the incorporators. Iroquois Furnace Co., of Chicago, to manufacture iron and steel; the incorporators are Robert D. McFadden, Richard Gardner and Henry A. Gardner. The capital stock is $500,000.

The Chicago Railway Appliance Co., of Chicago, with a capital stock of $100,000, to manufacture improvements in railroad cars. The incorporators are: C. A. Schroyer, F. T. Cardo and F. E. Green. The Montgomery Palace Stock Car Co., of Chicago, to manufacture improved stock car.

A factory is to be erected at Kalamazoo, Mich., to manufacture a surface cattle guard invented by Col. P. Merrell, of St. Louis.

The Central of Georgia has decided to use the Pintsch gas lighting system in its cars. The Safety Car Heating & Lighting Co., of New York, is making the necessary changes.

The New York, Lake Erie & Western is putting in a plant of 46 arc and 136 incandescent electric lights for lighting its station, shops and yard at Susquehanna, Pa.

The Pennsylvania Rolled Steel Car Wheel Co., of Norristown, Pa., will erect two open-hearth furnaces at its new plant now being built. The rolling machines will be placed near the furnaces, to be economically operated in connection with them. William Todd & Co., of Youngston, O., have the contract for a 15,000 H. P. engine for the works.

The Detroit Steel & Spring Co., of Detroit, Mich., employing about 400 men, the principal product being car springs and bar iron, suspended payment last week. The liabilities are $300,000. A chattel mortgage on the plant for $150,000 was filed early this month to secure part of the indebtedness. The principal creditors are Naylor & Co., New York, $23,000; Carnegie, Phipps & Co., Pittsburgh, $20,000 and Brier Hill Co., Youngstown, O., $20,000. Morris S. Williams has been appointed trustee.

Iron and Steel.

The Southern Iron Co. has commenced the construction of its steel plant at Chattanooga, Tenn. It is proposed to build two 20-ton basic Siemens furnaces.

The North Carolina Steel & Iron Co., of Greensboro, is soon to build two furnaces, one to make Bessemer iron and the other mill and foundry iron.

The Cambridge Iron & Steel Co., of Cambridge, O., has commenced operations in its steel department. The sheet mills will be in operation in about two weeks. The engines of this plant are of the Corliss type, made by the Bass Foundry & Machine Co., Fort Wayne, Ind., and the roll trains were built by the Lloyd Booth Co., Youngstown, O.

The Belleville Steel Company, of Belleville, Ill., has been organized to manufacture steel products. The capital stock is $450,000. The incorporators are R. W. Waugh, W. W. Waugh, and T. A. Mysenburg.

A basic open hearth furnace is being built at the North Chicago works of the Illinois Steel Co.

The Colorado Coal & Iron Co., has elected the following directors: Edward J. Berwind, William A. Dick, and Henry S. Grove, of Philadelphia; Earnest Thaiman, Henry K. McHarg, F. K. Lehman, and Chester Griswold, of New York; Mahlon D. Thatcher, of Peublo, Colo.; and C. S. Morey, of Denver, Colo.

Last week the fires were started in the furnaces at the rod mill of the New Castle Steel Co., at New Castle, Pa., and on Monday the mill resumed operations.

Furnace C, of Carnegie Bros. & Co., Limited, of Braddock, Pa., has been blown out for relining and repairs. The last run was three years and 20 days, the average daily production being 178 tons, a total production of 199,778 tons.

Jones & Laughlins, Limited, Pittsburgh, are putting 47 new Hancock tubular boilers in their plant.

The Vulcan Forge & Iron Works, at Pittsburgh, formerly operated by Long & Co., is now operated by the Lockhart Iron & Steel Co. on merchant iron. Charles Lockhart is President, and W. M. McKelvey is Vice-President and General Manager of the new company.

William Frech, of Chicago, is erecting a machine shop and foundry at Streator, Ill., for making punching machinery, machine tools and patented articles. The larger part of the plant will be removed to that point.

The Slatington Rolling Mill Co. proposes to erect a rolling mill at Slatington, Pa. The company has a capital stock of $100,000. The following are the directors: Joel Neff, F. Horlacher, David Williams, Hugh L. Davis, A. P. Steckel, D. D. Roper and John W. Hopkins.

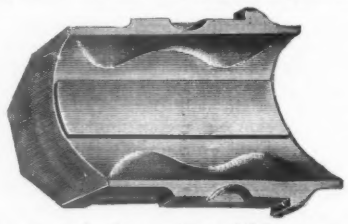
The Rail Market.

Steel Rails.—The market is still weak, more particularly in the East, but it is relatively firm as compared with other lines of the iron and steel trade. Many of the mills, however, have orders for some months ahead. There are rumors of large sales; but it is hard to confirm them. Among these reports are 5,000 tons by eastern mills for Alabama, 12,000 tons by the Johnstown Co. of Cambria for St. Louis, and 5,000 tons by Pittsburgh and Chicago mills for western roads. Quotations are: Eastern mills, $33@$33.50; Pittsburgh, $32.50@$33.50, and Chicago, $33.

Old Rails.—Quotations are: New York, $23.50@$24 for tees; at Pittsburgh, $23.50 for old iron rails and $21@$21.50, nominally, for old steel rails; at Chicago, $22.50@$23 nominally, for old iron rails, and $19@$19.50 and $20.50 for old steel rails.

The Stone Patent Oil Cellar Brass.

The journal bearing herewith has been ordered in large lots for trial by several roads recently. It has the merit of being well made, of good material, and has shown good results in reducing the heating of journals. The claims made for it are that it is filled in such a form as to materally assist the lubricant to reach the journals, and



in that it is preferable to the solid brass. It will be noticed that the lower edges of the filling are curved, as shown in the cut. The lining of the brass is not of lead, but made of a special mixture which will not run out at the sides. It is known as the "Stone patent oil cellar brass," and is manufactured by the Stone & Weiskopf Co., Pittsburgh, Pa.

Baltic Canal.

According to German advices the work of building the canal to connect the North and Baltic seas is progressing in an encouraging manner. As a measure of the extent of the undertaking the following figures are of interest: There are employed at present 6,300 laborers, 24 German and 4 Dutch excavating machines, 18 German and 7 Dutch dredges, 10 steam boats, 57 conveying machines, 12 steam pumps, 79 locomotives and 3,012 cars for carrying earth. There are about 100 miles of track in use for the construction trains.

Experimental Rail Sections.

The C. B. & Q. has now in track 7½ miles of the Delano section, which we illustrated April 12, 1889, and of which we have frequently spoken. This has been in for nearly a year, and six miles more will soon be laid. We are told that the rail is doing very well.

The Polson Iron Works.

The Polson Iron Works Co., of Toronto and Owen Sound, Ont., which failed some time ago, is to be reorganized. Subscriptions to the capital stock of the new company amount to $256,000. An order for the discharge of the liquidator has been applied for. The following is the new board of directors: A. D. Lee, Thomas West, William Polson, James Worthington and F. B. Polson, Toronto; Dugald Graham, Montreal; Hon. W. E. Sanford, Hamilton, Ont.; J. B. Miller, Parry Sound; Dr. J. F. Chamberlain, Morrisburg, and F. W. Barrett, Owen Sound.

Union Switch & Signal Co.

This company was never so busy as at present. The work turned out this year has been double that produced in the same period in any preceding year, while inquiries for estimates, etc., are much larger than ever before. Much of the greatest part of the work is on interlocking, but the block signaling work is increasing. The company now has an order in hand for pneumatic block signaling for the Chicago, Burlington & Quincy at Chicago. The track covered will be about three miles, divided into approximately half-mile blocks, the work to include two interlocking machines, one with six levers and one with 12. These also will be pneumatic. The company has in hand and about perfected an interlocking machine using tongue locking. The locking mechanism is as simple as the Stevens, but so arranged that much less work will be imposed upon the driving surfaces, and consequently the wear will be much reduced. The system of locking adapts itself readily to the most complicated special locking, and is in several respects superior to anything that we have seen.

Steel Ties.

The Homestead Works, Pittsburgh, have received an order for 1,500 standard steel ties for the Delaware & Hudson Canal Co. They are to be put in the track somewhere near Saratoga, N. Y.

A Niagara Ship Canal.

Mr. W. P. Judson has lately published an argument for the building by the United States Government of a ship canal around Niagara on New York soil. A 20-ft. waterway from Lake Erie to Lake Ontario, passing around Niagara Falls and keeping within the State of New York, is, he argues, both a commercial and military necessity. Simply regarded as a military work, the Niagara ship canal would be an economical substitute for defenses otherwise needed on the northern frontier, but, unlike most military works, it would be still more valuable for peaceful commerce. Many routes have already been surveyed for this canal, the two most feasible of which are the Wilson or Twelve Mile Creek route, 18¼ miles long, which can be built with double locks at a cost of $29,347,900, and the Olcott or Eighteen Mile Creek route, 25.28 miles in length, the estimated cost of which, with single locks that would do the work of the double ones on the other route, is $23,617,900. The line of this route begins at the head of Olcott Harbor on Lake Ontario, 18 miles east from the mouth of the Niagara River, follows the course of Eighteen Mile Creek for four miles, through a natural gorge which offer great advantages in building; ascends gradually a table land till it reaches the foot of the mountain ridge, when it enters another valley two and one-eighth miles in length, which is followed to its head; thence in a tolerably direct line west by south to the east end of Beach Ridge, when it strikes a straight and easy long level which brings it out into the Niagara River near the mouth of Tonawanda Creek. This route would require 18 lifts, and they would be so arranged that single locks would be all that were required, while the long level midway of the ascent would offer important aid in the fact that water can be supplied to the lower locks without drawing from the summit levels. With a storage basin of moderate depth and capacity the locks could be used independently of each other, thus saving much annoyance and oftentimes delay. This route also offers superior features for operation, for there are two levels of 12 and six miles respectively, on which a very good rate of speed could be safely made.

A New Storage Battery.

Sidney H. Barrett, of Springfield, Mass., has invented a new form of storage battery. After months of investigation, he has succeeded in making a combination of the usual leaden plates of the storage battery by which the active material is caged so as to prevent the falling out which inevitably happens with the present form of storage battery after a short term of service. The arrangement of the plates is also such as to prevent the twisting and bending, which was a serious drawback, and the new cell of the same efficiency as the Julien cell, which is the lightest and most compact now on the market, occupies but half the space and weighs but half as much. The complete cell weighs 18 lbs., and is composed of nine compound plates, each 6 × 4½ ins. in size, the capacity being 125 ampère hours. Barrett & Gardner, the makers, are now filling orders for extra cars on the Connecticut River Railroad, and for the Harris palatial car, which is building at Brightwood. A stock company will probably be formed to conduct the business. Mr. Barrett was formerly superintendent of the Julien Electric Co., and has a reputation as an electrician.—*Springfield Republican.*

Protection Against the Teredo.

On the authority of Engineer Huson, of the Northern Pacific road, a method of coating piles with asphalt to protect them against attacks by the teredo is entirely successful. Piles coated with this substance, it is said were driven into boulders without shattering the coating, which was the only trouble feared. The cost was about 12 cents a lineal foot for each pile. Unless some protection is employed, piles driven in salt water on the Pacific Coast will be eaten away in from one to two years.—*Northwestern Lumberman.*

Locomotive Works in Australia.

We understand that a contract has been made between Sir Saul Samuel, K.C.M.G., C.B., the Agent-General for the government of New South Wales in London, acting on behalf of his government and a syndicate in this country, for the establishment in that colony of locomotive works upon an extensive scale, as recently advertised for by the New South Wales Railway Commissioners in the English and Colonial papers. The syndicate will be known as "The Australasian Locomotive Engineering Co." Mr. Dugald Drummond, Locomotive Superintendent of the Caledonian Railway Co., is the Managing Director of the new company.—*Herapath's.*

The Tehuantepec Ship Railway.

Mr. Corthell is reported as saying that he learned from high official sources while in the City of Mexico that negotiations were in progress, which, when concluded, would lead to the construction and completion of the Tehuantepec Ship Railway at an early date. This had been brought about by Colonel Andrews, who had, since the death of Captain Eads, persistently followed up this matter in this country and in Europe. If the propositions made to the Mexican Government were accepted

the enterprise would be in the best possible shape, not only for construction but for successful operation. Time and the march of events had proven the best friends of the ship railway project, and he felt more than ever confident that in the near future the great work left incomplete by the ultimately death of its great projector would be constructed.

Electric Train Lighting on the Connecticut River Road.

This company, which has had a train, lighted by electricity, running between Springfield and Northampton for over two years, has just received six new passenger cars from the Wason Manufacturing Co., which are equipped for electric lighting, and which will at once be put in service. The apparatus used on this road was put in by Mr. S. H. Barrett, who has recently perfected an improved form of storage battery from which he expects more economical results than anything heretofore attained. The electric-lighted train hitherto used has been kept in local service, and has been run by a dynamo placed in the baggage car. The dynamo will be retained, but a storage battery of 50 cells will be added for the purpose of providing a larger reserve for use when steam is shut off. The officers of the road say that the system gives complete satisfaction.

Ship Building.

The New York, Philadelphia & Norfolk has contracted with the Harlan & Hollingsworth Co., of Wilmington, Del., for a new freight and passenger steamer for service between Elizabeth City, Va., and Newberne, N. C. The vessel is to be completed in September, and is expected to make the trip (156 miles) in 12 hours.

Westinghouse Street Railroad Motor.

The Westinghouse Electric & Mfg. Co., of Pittsburgh, has organized the Westinghouse Electric Railway Co., with a capital stock of $2,500,000. The company will build an alternating current motor for electric street roads. No details of the system which is to be used have been published, but it is stated that the private experiments which have been made have been quite satisfactory. It is believed that the Tesla motor will be used in connection with other appliances which the Westinghouse company has from time to time patented or purchased. It was at first intended to build cars, but at present only the electric plant will be furnished.

LOCOMOTIVE BUILDING.

The Louisville, New Orleans & Texas will shortly place orders for 15 locomotives with eastern builders.

The Baldwin Locomotive Works are building four locomotives for the Birmingham, Sheffield & Tennessee River road for delivery in May and June.

The buildings of the old repair shops at Bordentown, N. J., are being altered and enlarged for the King Locomotive Co. New machinery has been ordered for the works, and will soon be put in. The company has purchased about 10 acres of land.

The Old Colony road has purchased from the Mason Machine Co., Taunton, Mass., a bogie engine, built for the Atlantic & Ohio road about four years ago, and which was never delivered.

The Redondo Beach road has received several light engines from the Baldwin Locomotive Works.

The Gulf & Chicago will, it is stated, soon order five 40-ton locomotives.

The Seattle, Lake Shore & Eastern has recently let contracts for four heavy locomotives.

The Rogers Locomotive Works have recently delivered a heavy engine to the Kansas City, Watkins & Gulf.

The Strong Locomotive Works.

We have the following direct from the Strong Co.: We propose building the works as outlined and described in the Cincinnati *Commercial Gazette*. The details for these buildings are all worked up and contracts will be let within six weeks to one of the large bridge building companies for the iron work; the brick will be made on the ground, and the stone will be quarried out of the hills on the property we have acquired, which consists of about 1,350 acres, located about 15 miles from the heart of the city up the Mill Creek Valley, where we have the Cincinnati, Hamilton & Dayton, the Cleveland, Cincinnati, Chicago & St. Louis, and the Pennsylvania lines, and also the Erie, which passes over the Big Four system at this point. These lines will all be connected by a track extending across our property, which will give us the best of railroad facilities, and Cincinnati rates on all material coming and going from any point on any one of these lines and their connecting lines, which, as you will understand, gives us the entire United States. We have arranged for Cincinnati switching rates on all cars loaded in Cincinnati, which practically places us in Cincinnati, as far as river rates are concerned, giving us a very low price for fuel and cheap iron, and this, as you are aware, is a good labor market, the best to be found west of Philadelphia. We propose making use of the most improved appliances in every department of the works, and shall introduce many new and novel methods in forging, milling, gang-drilling, etc., so as to produce the greatest quantity from the least possible cost, and to maintain a high standard of excellence.

CAR BUILDING.

The Louisville, New Orleans & Texas is stated to be in the market for 700 freight cars.

The United States Rolling Stock Co. has the order for building 100 drop bottom gondola cars for the Birmingham, Sheffield & Tennessee River road. The cars are to be delivered by July 15.

The Norfolk & Western has just received five passenger cars from the Jackson & Sharp Co., of Wilmington, Del.

The Chicago & Alton road is building 200 new furniture cars at the Bloomington shops. They will be 45 ft. long, 9 ft. wide and 9 ft. high.

The Chicago, St. Paul & Kansas City has recently placed an order for 1,000 cars with the Haskell & Barker Car Co.

The Gilbert Car Mfg. Co., of Troy, N. Y., has received an order to build the cars for two passenger trains for the Buenos Ayres & Ensenda Port road. The order includes eight saloon, four ladies', two buffet and two baggage cars.

In addition to the large orders for freight equipment recently let by the Denver & Rio Grande, the company is building a number of standard gauge cars at its own shops, and is also altering some of the narrow gauge cars.

The Pennsylvania, Poughkeepsie & Boston received six new passenger cars this week from Pittsburgh.

The Philadelphia & Reading has received 20 of the 50 passenger cars being built at the Pullman Car Works. The cars are finished in carved mahogany and the ceiling is in antique oak. They are equipped with the Baker improved heater, pneumatic train signal and Hale & Kilburn seats. Over 200 twin hopper gondolas of 70,000 lbs. capacity have been received. They are 36 ft. long, with oak sides and flooring of Norway pine. These are equipped with the Van Dorston coupler and the Butler drawbar.

The Wason Car Mfg. Co., of Brightwood, Mass., have delivered six passenger cars for the Connecticut River road. The company has also delivered the last seven of the order for 12 passenger cars for the Maine Central.

The Haskell & Barker Car Co., of Michigan City, Ind., has been awarded the contract for building 150 box cars for the Evansville & Terre Haute, to be delivered during May and June. The contract amounts to $70,200, each car costing $468.

The company which proposes to build steel car works at Harvey, Ill., was incorporated last week with a capital stock of $500,000. The directors are T. W. Harvey, G. L. Harvey and A. N. Turner.

The Mount Vernon Car Mfg. Co., of Mount Vernon, Ind., has been organized with the following Board of Directors: D. O. Settlewire, President; W. C. Arthurs, Secretary and Treasurer; S. M. Grubbs, S. T. Stratton, John C. Lueckel and Frank Snyder. Mr. Snyder will be Superintendent of the works.

The Savannah, Florida & Western has just received eight observatory cars.

The Burton Stock Car Co. is building at its shops at Wichita, Kan., 50 improved cars, having a capacity of 20 cattle or horses each. The cars will be equipped with the Hinson coupler, and part of the lot will have passenger trucks. The company is also building 10 of the perfected palace horse cars, to carry 16 horses each. These cars will be equipped with the Miller-Hinson coupler. The company is building at 47th and Morgan streets, Chicago, a frame building, 60x40 ft., for a paint and repair shop.

Contracts have been recently let by the Seattle, Lake Shore & Eastern for 60 box and 10 stock cars and two cabooses. The road will also build 300 cars in Seattle, ordering the trucks from the East.

BRIDGE BUILDING.

Allegheny, Pa.—The Pittsburgh, Fort Wayne & Chicago is building an iron and steel viaduct from Verner avenue across Spruce street to Porter street. It will be 600 ft. long, including the approaches, and will rest on heavy masonry.

Amsterdam, N. Y.—A bill has passed the New York Legislature, appropriating $8,000 for a bridge over the Erie Canal at Amsterdam.

Benton, Ark.—The Youngstown Bridge Co. has received the contract to build an iron bridge across the Saline River at $7,000.

Birmingham, Ala.—The Birmingham Bridge & Bolt Works will, it is stated, be removed from Birmingham to Avondale, Ala., and enlarged, and new machinery added.

Bradford, Pa.—Proposals will be received by the City Clerk of Bradford, Pa., until May 5 for constructing the iron superstructure and abutments for a bridge over the east branch of Tuna Creek at Main street.

Burnet, Tex.—F. H. Holloway, of Burnet, is interested in a proposed bridge at this place, which will be about 420 ft. long.

Chappells, S. C.—The County Commissioners of Edgefield and Newberry counties may decide to erect a proposed bridge over the Saluda River at Chappells.

Columbus, O.—A bill authorizing the city to issue $50,000 in bonds for building bridges across railroad tracks has passed the lower branch of the Ohio Legislature.

Cottageville, S. C.—The contract for building the bridge across the Edisto River at Sullivan's Ferry has been let to Ackerman & Perry.

Dallas, Tex.—The Houston & Texas Central is building a bridge over White Rock Creek, north of Dallas. The stone piers and abutments have been finished, and the iron and steel superstructure is now being erected.

Holyoke, Mass.—The following bids were received for building an iron plate girder bridge at Dwight street, in Holyoke, Mass.: Pittsburgh Bridge Co., $25,370; Berlin Bridge Co., $24,767; Penn Bridge Co., Beaver Falls, Pa., $34,800; R. F. Hawkins & Co., $17,700; Groton Bridge Co., Groton, N. Y., $26,715, $28,000, $27,750, $39,000; Dean & Westbrook, New York, $26,050, $17,300; Wrought Iron Bridge Co., Canton, O., $27,750; Boston Iron Bridge Co., $33,059; New Jersey Steel & Iron Co., $29,895; R. Redfield & Sons, New Haven, Conn., $24,540, $23,190; King Iron Bridge Co., Cleveland, O., $32,250; Wallis Iron Works, Jersey City, N. J., $21,983, $17,139, $12,100. The bids and plans were referred to the city engineer.

Jackson, Miss.—The King Iron Bridge Co., of Cleveland, O., has been awarded the contract to build the iron approach to the Pearl River bridge for $10,800.

Jefferson, Or.—The appropriation for constructing a bridge across the Santian River at Jefferson now amounts to $16,000. This sum has been voted by Marion County and the towns interested.

Knoxville, Tenn.—The contract for building the stone piers for the Tennessee River bridge of the Knoxville Southern, at Knoxville, has been let to Reps, Jones & Co., of Knoxville. The iron work of the bridge has not been let as yet.

McKeesport, Pa.—John Dale, of Lincoln Township, is organizing a company to build a highway bridge across the Youghiogheny River, at 13th street, in McKeesport. The cost will probably be nearly $35,000.

Moscow, Cal.—The North Pacific Coast road is constructing a combination wood and iron bridge over the Russian River between Moscow and Duncan's Mills. The bridge will be completed by May 1.

Philadelphia, Pa.—The Baltimore & Ohio has completed a double track iron bridge at the Falls of Schuylkill, Philadelphia. It is an iron plate girder with eight spans and seven piers, three of the latter being in the river. The bridge is 33 ft. above the river. The eastern span is of stone with an 80-ft. arch from the springers crossing a driveway.

Pikeville, Ky.—The Pikeville & Big Sandy River Bridge Co., has been organized at Pikeville.

Pittsburgh, Pa.—J. Speer, of Pittsburgh, County Controller, received bids on April 23, for the superstructure and masonry of two wrought-iron, pin-connected truss and four plate-girder highway bridges, and for superstructure only of one wrought-iron pin-connected truss bridge; also for the construction of two stone-arch bridges, located as follows: No. 1. Over Montour Run, Schaffers, O.: A through plate-girder bridge, 46½ ft. clear span, 50 ft. extreme length; depth of girder, 60 in.; live load, 1,700 lbs. per lineal ft.; to have 3 intermediate floor beams. No. 2. Over Toms Run, at Dixmont: Stone-arch bridge, 20-ft. span, semi-circular arch. No. 3. Over Poketos Creek, Dougherty's Mill: Low truss bridge, 60 ft. centre to centre of end pins; two trusses, each 7 ft. high. No. 4. Over Big Sewickley Creek, Bradford's farm (skew bridge): Low truss bridge, 77 ft. centre to centre of end pins, two trusses, each 8 ft. high. No. 5. Over Montour Run, Beaver road crossing (skew bridge): Through plate girder bridge, 57 ft. clear span, 60½ ft. extreme length; depth of girder, 60 in.; to have five intermediate floor beams. No. 6. Over Robinson's Run, Willow Grove station (bridge on grade): Plate girder bridge, 32 ft. clear span, 35 ft. extreme length; depth of girder, 28 in. No. 7. Over Flaugherty's Run: Through plate-girder bridge, 50 ft. clear span, 53½ ft. extreme length; depth of girder, 60 in.; to have five intermediate floor beams. No. 8. Over Burn's Run, Gumbert's: Stone-arch bridge, 16 ft. span, semi-circular arch. No. 9. Superstructure of bridge over Back channel, Ohio River, at Neville Island: High truss bridge of three spans, each 194 ft. centre to centre of end pins; height of truss 28 ft., and divided into 14 panels; clear width of roadway, 20 ft.; live load, 2,400 lbs. per lineal foot and static load, 1,500 lbs. per lineal foot.

The Pittsburgh, Virginia & Charleston Division of the Pennsylvania is erecting a bridge at South Seventh street, on the south side of the city. It is stated that other bridges will also be built.

Prestonburg, Ky.—The Kentucky Legislature has been petitioned for a charter for the Prestonburg & Big Sandy River Bridge Co.

Saskatoon, Saskatchewan.—The Qu'Appelle, Long Lake & Saskatchewan is to build a large bridge across the Saskatchewan River north of Saskatoon. The plans have not yet been prepared, nor have the number of piers been decided upon, but the bridge will probably be 1,000 ft. long between abutments.

Somerville, Mass.—The Boston & Albany has submitted plans to the State Harbor Commissioners for a proposed bridge across the Mystic River, between Somerville and Everett.

Terrace Park, O.—A bill has been introduced in the Ohio Legislature to authorize the County Commissioners of Hamilton County to build a bridge over the Little Miami River, near Terrace Park.

Tonawanda, N. Y.—The New York State Assembly has passed a bill appropriating $20,000 for a bridge over the Erie Canal at this place.

Verrugas Viaduct.—It will be remembered that the Verrugas viaduct, on the Lima & Oroya railroad in Peru, was destroyed by a mass of rock and earth on March 23, 1889. The old structure had four Fink trusses, supported by three iron piers and two stone abutments. The centre pier was in the middle of the ravine, and it was this pier which was destroyed, carrying with it two of the spans. Mr. L. L. Buck, of New York, who erected this viaduct in 1872, has completed plans for a new bridge to replace it. It will be a cantilever, 575 ft. long and 252 ft. high from the bottom of the chasm. It will be built of iron and the contract for the material has been let to the New Jersey Steel & Iron Co., of Trenton. The principal dimensions of the new structure will be as follows: length of centre span, 105 ft.; channel arms, 65 ft. each, shore arms, 140 ft.; distance between trusses, 17 ft. The towers will be 30 ft. wide, the eastern one being 154 ft. high to the base of rail and the western, or Lima tower, 175 ft. high.

Waynesborough, Va.—Plans are being prepared for an iron bridge over the James River from the property of the Waynesborough Land Co., at Waynesborough. Bids for building the structure have been asked.

Wheeling, W. Va.—At an election in Wheeling, April 15, it was voted to issue bonds to the amount of $100,000 for the purpose of erecting a stone bridge across Wheeling Creek, at Main street.

Woodbury, Ga.—The work of constructing the bridge for the Macon & Birmingham over Flint River, three miles from Woodbury, is in progress and the caisson for the centre pier is in place and nearly completed. Grant Wilkins, of Atlanta, is the contractor. The bridge consists of two abutments and one pier about 20 ft. above low water. This work will be of brick, the stone found in the vicinity being of an inferior quality and unfit for building purposes.

Elmira Bridge Works.—The Elmira Bridge Co., of Elmira, N. Y., broke ground for its plant about a year ago, and all the machinery was in place and work begun six months later. The works cover 14 acres and employ 125 men. The plant is on the main line of the New York, Lake Erie & Western, and the facilities for receiving and forwarding material are good. The works include a machine shop 70 x 450 ft., engine and boiler-room, a forge shop 80 x 150 ft., with a wing 36 x 80 ft., used for a blacksmith shop; a wood-working shop 35 x 110 ft., and other smaller buildings. The shops are steam-heated and lighted by electricity. In the riveting and machine shop there is a plate-shearing and punching machine and an angle and bar shear-machine capable of cutting an iron bar 10 in. wide and 2½ in. thick. All the material in the rough state is unloaded from a switch extending 1,000 ft. into the yards from the main line of the railroad, and, after going through the various courses of treatment, is loaded on the cars at the opposite end of the shops, a part of a bridge. There are many narrow-gauge tracks through the shops and yards, and a number of traveling cranes and other appliances to facilitate the work. A 36-in. planer is located in a wing extending off the machine shop, also a radial drill, drilling machine, four lathes, a centering and shaping machine. Seven new radial drills are to be added for use in making steel bridges. A steam riveting machine has just been finished in this shop. It weighs 5 tons and applies 37 tons of pressure in driving a rivet. There is also a vertical drill, a horizontal drill and a rotary facing machine. Power is furnished by a 61 H. P. engine. In the engine room the pumps and air compressors are located, and a dynamo for the electric light plant. The forge shop contains a 2,500-lb. steam hammer, and a number of furnaces, bolt-cutting and drilling machines.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Maine, semi-annual, 4½ per cent.
Eastern (Mass.), semi-annual, 3½ per cent.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Anniston & Atlantic, annual, Anniston, Ala., April 30.
Atchison, Topeka & Santa Fe, annual, Boston, Mass., May 8.
Atlantic & Pacific, annual, 45 Broadway, New York City, May 15.
Bessemer & Birmingham, special, Birmingham, Ala., May 5, to act upon a proposed consolidation with the Birmingham Union.
Birmingham Union, special, Birmingham, Ala., May 5, to act upon a proposed consolidation.
Canadian Pacific, annual, Montreal, P. Q ıe., May 14.
Catawissa, annual, Philadelphia, Pa., May 5.
Central of New Jersey, annual, New York City, May 9.
Chicago, Rock Island & Pacific, annual, Chicago, Ill., June 4.
Cincinnati & West Virginia, special, United Bank Building, Cincinnati, Ohio, May 12, to vote upon a proposed increase of the capital stock.
Cleveland, Lorain & Wheeling, annual, Cleveland, O., May 14.
Delaware & Hudson Canal, annual, New York City, May 13.
Elmira & Lake Ontario, annual, New York City, May 1.
Lake Shore & Michigan Southern, annual, New York City, May 7.
Louisiana & Missouri River, annual, St. Louis, Mo., May 7.
Louisville, New Orleans & Texas, special, Memphis, Tenn., June 5.
Mexican Central, annual, Boston, Mass., May 7.
Michigan Central, annual, New York City, May 7.
Milwaukee, Lake Shore & Western, annual, Milwaukee, Wis., June 11.
Missouri, Kansas & Texas, annual, Parsons, Tex., May 21.
New York, Chicago & St. Louis, annual, New York City, May 7.
Norfolk & Western, annual, Roanoke, Va., May 7.
Omaha & St. Louis, special, Stanberry, Mo., April 28.
Pittsburgh, Fort Wayne & Chicago, annual, Pittsburgh, Pa., May 21.
Pittsburgh & Western, annual, Allegheny City, Pa., May 5.
St. Lawrence & Adirondack, annual, Valleyfield, P. Que., May 1.
St. Louis & Terre Haute, annual, St. Louis, Mo., June 2.
Union Pacific, annual, Horticultural Hall, 101 Tremont street, Boston, Mass., April 30.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Mechanical Engineers* will hold its twenty-first annual convention at Cincinnati, O., May 13.

The *Railway Station Agents' Association* will hold its next annual convention at Cleveland, O., May 21.

The *Association of American Railway Accounting Officers* will hold its next annual meeting at the Stockton Hotel, Cape May, N. J., July 9.

The *Master Car Builders' Association* will hold its next annual convention at Old Point Comfort, Va., June 10. Rooms should be secured of Mr. F. N. Pike, manager, Hygeia Hotel, Fortress Monroe, Va.

The *American Railway Master Mechanics' Association* will hold its next annual convention at Old Point Comfort, Va., beginning June 17.

The *National Association of General Baggage Agents* will hold its next annual convention at Chicago, Ill., July 16.

The *Traveling Passenger Agents' Association* will hold its next annual convention at Buffalo, N. Y., August 19.

The *New England Roadmasters' Association* will hold its eighth annual meeting at Boston, Mass., Aug. 20 and 21.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Saturday following the second Wednesday of each month at 7:30 p. m. in the director's room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meeting on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Boston, at 7:30 p. m., on the third Wednesday in each month. The next meeting will be held at the American House.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the Fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the Southwest* holds regular meetings on the second Thursday evening of each month at 8 o'clock, at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Club of Kansas* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

American Railway Master Mechanics' Association.

The members of this association having voted by a large majority, as already noted, in favor of holding the next convention at Old Point Comfort, Fortress Monroe, Va., the Executive Committee has arranged to hold the meeting there. The Hygeia Hotel, Old Point Comfort, will accommodate members and their friends for $3 per day. Rooms will be reserved for the use of members till the day the meeting opens, June 17. Those desiring to secure rooms should apply to F. N. Pike, Hygeia Hotel, Fortress Monroe, Va. Messrs. W. Garstang, T. W. Gentry, and A. J Cromwell have been appointed by President Briggs, a committee to carry out arrangements for the convention.

Boston Society of Civil Engineers.

A regular meeting was held April 16, 1890, at the American House, Boston, Vice-President Freeman in the chair. Forty members and five visitors present. Messrs. Joseph P. Frizell, Eugene Griffin and Isaac Rich were elected to membership. The secretary read a letter from Clemens Herschel, accepting the presidency of the society, to which he was elected at the annual meeting. The business of the evening was the consideration of the reports from the several committees of the society. Reports were received from the committees on common headquarters for scientific societies, on national public works, on highway bridges, on weights and measures, on excursions and on the condition of the society's library.

Prof. S. H. Woodbridge, of the Mass. Institute of Technology, gave a very interesting account of the system of heating and ventilation which had been placed in the new engineering building of the Institute.

REPORT OF THE COMMITTEE ON HIGHWAY BRIDGES.

The Committee appointed to consider and report what legislative or other action for the improvement of highway bridges would be advisable reported as follows:

Your committee cannot recommend any of the projects which have thus far been proposed for insuring the safety of existing highway bridges and for improving the character of those yet to be built. None of these projects appear to be free from serious objections, and it is believed that some of them might lead to abuse greater than those that are said to exist at present.

Your committee believe that our society should take a conservative view of the subject and use its influence against hasty and radical movements until more definite evidence can be obtained as to the nature and extent of the danger existing in this state under the present practices and of the injury to the public and the engineering profession resulting therefrom.

They believe that the tendency of legislation should be toward fixing the responsibility for the maintenance, design and construction of highway bridges, and toward the free dissemination among engineers and the public of information relating to the status and condition of these structures.

To this end they favor a law requiring all parties responsible for the maintenance of highway bridges, to have these bridges examined periodically by a competent engineer, in each case, the reports of these examinations, together with descriptions, plans, and, if considered desirable, photographs of the structures, filed with the proper authorities, and made readily accessible to the public. These reports might also be filed at the State House, in charge of a suitable custodian, or printed in the form of a public document.

After the first examination and reports had been made, your Committee would recommend that the Committee on Roads and Bridges of the Legislature appoint a temporary commission of experts to examine and report upon the evidence thus accumulated, with authority to make further examination of the bridges when their character and condition are not fully established by the reports at hand. This commission should report fully and in detail to the said committee, and recommend such measures as might seem advisable for securing the proper maintenance and building of highway bridges in this state.

J. E. CHENEY,
D. H. ANDREWS,
E. S. SHAW,
} Committee.

Engineering Association of the Southwest.

A meeting was held on the evening of April 11 at which President John MacLeod presided, and 25 members were in attendance. A very cordial address of welcome to the Association was made by Col. Bennett H. Young, of Louisville. The ballot for election to membership resulted in the election of the following as members: Robert L. Engle, Engineer in Charge Louisville & Jeffersonville Bridge, Louisville, Ky.; Graham Macfarlane, Consulting Engineer, Louisville, Ky.; Harry P. McDonald, Architect, Louisville, Ky.; Thomas Sharp, President and General Manager Shoal Creek Iron Co. and Secretary and General Manager of the Smith & Sharp Mining Co., Nashville, Tenn. As Associates: Lewis Collins, President Collins Varnish Co., Louisville, Ky.; Udolpho Sneed, Vice-President and Business Manager of the Sneed & Co. Iron Works, Louisville, Ky.; James B. Speed, cement manufacturer, Louisville, Ky.

A communication was read from Mr. Wm. P. Shinn, Chairman of the committee of the American Society of Civil Engineers on the revision of its constitution relative to the matter of proposed forms of affiliation of local engineering organizations with the American Society of Civil Engineers, requesting this association to formulate its views and submit them by either report or by personal representation at a meeting of the committee of the American Society at New York in June, 1890. The matter was referred to the executive committee of the association, with instructions to report at the May meeting.

The programme of the evening was introduced by a paper entitled, "Excavating Under Pneumatic Pressure," by Mr. Charles Hermany, Chief Engineer of the Louisville Water Co., Louisville, Ky. The paper comprised a brief historical outline of the development of the present forms of excavating under pressure, with descriptions of the various devices employed. The paper gave particular attention, however, to a description of the construction and workings of the O'Connor excavating bucket, which Mr. Hermany had found very successful in the sinking of his immense pneumatic caisson for the foundations of the new pumping station in the bed of the Ohio River at Louisville. The device consists of a cylindrical bucket working in a cylindrical shaft that extends from the open air above to the working chamber of the caisson, with the bottom of the shaft closed, and access to it given through air-tight doors in its side near the bottom. The upper end of the bucket, which is closed at top and bottom, and has openings at the side to correspond with the openings in the shaft, is fitted with an extension or flange, which forms a conical air-tight valve, the seat of which is attached to the shaft, and is of sufficient diameter to permit the whole bucket except the top forming the valve to pass freely through. To operate the system, the bucket is lowered until the valve seats itself. The lower portion of the shaft is thus shut off from communication with the open air by the conical valve forming the top of the bucket. The air pressure in the caisson is then turned on to the portion of the shaft below the valve, the doors in the side of the shaft opened, and the operation of filling the buckets through these doors and the corresponding openings in the side of the bucket is effected. When ready to be hoisted, the doors entering the side of the shaft are closed, the air pressure in the lower portion of the shaft is released and the bucket is hoisted out of the shaft. While the lower portion is under pressure, the bucket valve is held to its seat against the upward air pressure below the valve by three conical-pointed screws that pass through the shaft and hold down the valve against its seat. When the bucket is to be hoisted these are backed out of the way.

The second paper of the evening, entitled "Foundations of the Louisville & Jeffersonville Bridge," which is now under construction, was read by the engineer in charge, Mr. Robert L. Engle, of Louisville, Ky. The structure will be a single track railroad bridge, with 5-ft. sidewalks on each side, and street traffic will be carried over by trains on flat cars with suitable railing and gates, a platform being built at each end of the bridge to allow teams to drive on and off. This arrangement is similar to that now in effect at Omaha, Neb., and a similar plan will be employed on the new Merchants' bridge at St. Louis, soon to be opened for traffic. Beginning at the Jeffersonville side, the bridge entire comprises an iron viaduct approach 4,073 ft. in length, with a maximum grade of 0.2 ft. per 100, then one span of 210 ft. in length, one of 550, one of 553, one of 550 and two of 341, closing with the Louisville approach, which will be an iron viaduct 2,740 ft. in length, with a grade of 1.2 ft. per 100, making the total length of iron work a little over 1¾ miles. The bridge will have no draw span, as the lowest point of the substructure will be 53 ft. above high water and 92.3 ft. above low water. Counting from the shore end of the 210-ft. Jeffersonville span, piers No. 1, 6 and 7 will be composed of ⅝-in. iron shells filled with concrete, No. 1 resting on rock, and Nos. 6 and 7 resting on pile foundations; Nos. 2, 3, 4 and 5 will be masonry piers composed of dimension face-stone with concrete backing. No 2 was built on bed rock in an open coffer dam. No 5, which is now completed to high water, was sunk to 44 ft. below low water by pneumatic caisson and a crib, and is the pier at which the accident occurred on Jan 9, by which 14 workmen lost their lives by the escape of the compressed air from the caisson. Nos. 3 and 4 will be sunk similarly to No. 5, though as yet no work has been done on them, except to build the caissons, which are now floated and waiting for the river to fall. Sooysmith & Co. are the contractors for the substructure. Both the papers of Mr. Hermany and Mr. Engle, with their drawings, will be published by the association at an early date. The discussion of Mr. Engle's paper drifted into a discussion on concrete and hydraulic cement, in which the cause of the acting of cement was discussed. On motion of Mr. E. C. Lewis, Messrs. Olin H. Landreth, William L. Dudley and Granville W. Shaw were appointed a committee to report on the present state of knowledge relating to the cause of the setting of cements and mortars.

The programme for the following day's entertainment of the Association was then read, and an invitation extended to the Association by the Louisville Southern Railroad to pass over its line and inspect its new Young High Bridge at Tyrone. The Association then adjourned to meet at Nashville on May 8.

On Saturday the 12th the Association was entertained by the resident members, aided by the proprietors and managers of the leading industrial establishments and railroads centering in Louisville. They were taken by the elevated road to visit the Kentucky and Indiana bridge and the Louisville bridge. They were then driven in carriages through the tornado district, and were taken to inspect the Louisville Water Company's pumping station, the water tower of which was entirely demolished by the recent tornado. The excursion stopped on the way to inspect the substructure work of the new Louisville and Jeffersonville bridge, and while returning were given a lunch on the train. The remainder of the afternoon was spent in a trip to the Crescent Hill Reservoir, the storage plant of the Louisville water system. While at the latter point the association was called to order in the gate house, and the following resolutions were adopted: *Resolved*, by the Engineering Society of the Southwest, that the thanks of this body be tendered to the Kentucky & Indiana Bridge Co., the Jeffersonville, Madison & Indianapolis and the Louisville & Nashville Railroads, the Galt House Co., Mr. R. L. Engle, the Louisville & Jeffersonville Bridge Co., Mr. Charles Hermany, and the Louisville Water Co. for courtesies extended to the Association during its meeting in Louisville, Ky.

After adjournment the visiting members assembled and adopted the following resolution: Resolved, that the visiting members of the Engineering Association of the Southwest extend to the local members of the Association their sincere thanks, and express their hearty appreciation of their kind entertainment and the courtesies extended while in Louisville.

Engineers' Society of Western Pennsylvania.

At the regular monthly meeting in Pittsburgh, April 15, Mr. W. C. Quincy read an address on reminiscences of railroad building on the Baltimore & Ohio. He read extracts from the early reports of the road, and spoke of the transportation of soldiers over it in 1831. In 1849 the speaker was a member of an engineering party which had in charge the construction of 20 tunnels on the line. For this work he received $1 a day, although it was very dangerous, and many deaths occurred from accidents. The incidents which happened during the civil war were also treated of at some length. There was some discussion by the members upon the subject

at the close of the address. W. A. Giles, William Morgan, James Ritchie, Fred A. Schreffler, Daniel Ashworth and Charles F. Scott, were elected members of the society.

Western Railway Club.

The subjects for the May meeting will be "Journal Boxes" and the Counter-balancing of Locomotives."

PERSONAL.

—Mr. John Van Nortwick died in Batavia, Ill., April 15, aged 81 years. He was formerly Chief Engineer of the Galena & Chicago Union, and also of the Chicago, Burlington & Quincy, and was President of the latter road.

—Mr. F. H. Treat has been appointed Superintendent of one of the works of the Illinois Steel Co. He has held a similar position with the Allegheny Bessemer Steel Co., of Pittsburgh.

—Mr. Cephas L. Hartwell, General Freight Agent of the Fitchburg road, died at Passadena, Cal., April 22, where he had gone on account of ill-health. Mr. Hartwell was 50 years old. The body will be brought to Waltham, Mass., for burial.

—Mr. W. A. Caswell has been appointed General Superintendent of the works of the Burton Stock Car Co., with office at Wichita, Kan., to succeed Mr. J. T. Chamberlain, who resigned to accept the position of Master Car-Builder of the Boston & Maine, as stated last week.

—Mr. Thomas B. Burnett, General Superintendent of the Peoria & Pekin Union road, resigned this week to accept a position with a California road. Mr. Burnett has been in railroad service since 1862, and has held the position he has just resigned since December, 1881.

—Mr. P. J. Flynn, General Western Passenger and Freight Agent of the Missouri Pacific, at Denver, Colo. resigned this week to enter the service of another company. He has held this office since July last, and previously held a similar position with the Atchison, Topeka & Santa Fé for a number of years.

—Mr. J. D. Yarrington, Second Vice-President of the Eastern Division of the Newport News & Mississippi Valley Co., has tendered his resignation, to take effect May 1, when he will retire from railroad service, having purchased a large stock farm in Kentucky. Mr. H. E. Huntington, General Manager of the Kentucky Central, will succeed Mr. Yarrington, with the title of General Manager.

—With sincere regret we notice the death of Monsieur David Banderali, Ingenieur en Chef du Service Central du Matériel et de la traction de la Compaigne des Chemins de Fer du Nord, France. He died at Paris on March 30, in his 55th year. M. Banderali received his professional education at the Ecole Polytechnique and the Ecole des Mines, and entered the service of the Northern Railroad in 1859. He had a good command of English, was a fluent writer and speaker and an able engineer and administrator. He was an earnest advocate of many of the leading features of American railroad construction, which he carefully studied in his visits to this country, and was busily engaged in adapting them, where practicable, to the railroads under his charge at the time of his death. He will be kindly remembered by American engineers and railroad officers, to whom he was ever ready to extend the hand of friendship and to do all in his power to make their visits to his country pleasant and profitable.

—Samuel Fletcher Pierson, late Passenger Commissioner of the Trunk Line Association, died at his home in Holmesburg, Pa., Tuesday evening of this week. He had been sick for about two weeks from a complication of diseases, but his death was caused by hemorrhage of the lungs coupled with heart trouble. He was a victim of "the grip" a couple of months ago, and his later sickness was ascribed to his attempt to take up his business duties too soon. The burial will be in Painesville, Ohio, to-day. Mr. Pierson was born in Bergen, N. Y., Jan. 11, 1835. He went West when a young man, and in 1859 he entered the railroad service as a clerk in the passenger department of the Cleveland, Columbus & Cincinnati. He was General Ticket Agent of this road from 1865 to 1878. Mr. Pierson's judicial qualities early brought to him connection with the railroads in the capacity of arbitrator and commissioner. He was for a short time General Agent of the Indianapolis Eastbound Freight Association, and in 1879 became Commissioner of the Colorado Pool. Mr. Pierson came to New York in 1883. After his resignation from the commissionership, in 1889, he was chosen President of the Pennsylvania, Lehigh & Eastern, which contempleted the building of a road from Port Jervis to Tomhicken, Pa. It was his devotion to the affairs of this new company that led to his physical breakdown. He married Miss D. J. McWade, of Oberlin, O., who, with a grown daughter, survives him.

ELECTIONS AND APPOINTMENTS.

Abbeville & Tifton.—The incorporators of this Georgia road are: George W. Perkins, R. L. Worthen, J. W. Smith, Henry C. Perkins, Zachariah Daniel, Charles Hicks, A. F. Daley and O. H. Rogers.

Bayard, Petersburg & Moorefield.—The company has been incorporated in West Virginia by John W. Anhuser, of Bayard, W. Va.; James B. Rees, of Rees' Tannery, Mineral County; John R. Haufman, of Sunbury, Pa.; Robert F. Whitmer, of Philadelphia, and D. Robert Leatherman, of Burlington, Mineral County, W. Va.

Bridgeport & Decatur.—The officers of this road are: J. J. Lang, President; W. J. Keller, Vice-President; John F. Elliot, Secretary; and Henry Greathouse, Treasurer, all of Decatur, Tex.

Bridgeport Southern.—The incorporators of this Alabama road are: L. L. Cochran, John A. Davis, W. W. Haralson and J. T. Douglass, all of Fort Payne, Ala.; J. B. Haralson, of Langston; R. C. Johnson, of Bridgeport; J. E. Brown, of Scottsboro, Ala., and A. J. McBride, of Atlanta, Ga.

Brunswick, Lake City & Tampa.—The incorporators of the company are: W. H. Perry, A. G. Bigelow, N. S. Collins, J. W. Perry, B. H. Palmer.

Calabasso, Tucson & Northwestern.—The annual meeting of the company was held at No. 32 Liberty street, New York, April 22. The election of directors resulted in the choice of Charles C. Dodge, Charles P. Sykes, W. de L. Benedict, H. D. Faulkner, P. K. Green, John Van Nest, George C. Scofield, Edward Benedict, Henry Belden, Edward T. Westell, Eugene K. Sykes, Charles R. Drake and H. S. Stevens.

Chagrin Falls & Southern.—J. W. Wardwell, Superintendent of the Cleveland & Canton, has been elected Treasurer to succeed Joseph Stoneman, resigned.

Columbus Belt Line.—The incorporators are: J. W. Wardwell, Almon S. Emery, H. A. Kennedy, Samuel D. Mayer and Charles H. Blood, of Cleveland.

Dublin & Abbeville.—R. L. Warthen, J. W. Smith, O. H. Rogers, G. W. Perkins, A. F. Daley and Charles Hicks are the first directors of this recently organized Georgia road.

Dutchess County.—The first Board of Directors of this company are: J. C. Stanton, D. J. McNiece, Thomas F. Mason, William B. McNiece, and D. Odell, of New York City; D. N. Stanton, of Yonkers, N. Y., and W. R. Todd, of Morristown, N. J.

Eufaula Terminal.—The directors have elected Capt. S. H. Dent President, and A. H. Merrill, Secretary and Treasurer, both with office at Eufaula, Ala.

Ivorydale & Mill Creek Valley.—The officers of this road are: William A. Procter, President; D. B. Gamble, Treasurer; Harry W. Brown, Secretary and General Manager, all of Cincinnati, Ohio.

Kansas City, El Paso & Texas.—Charles Davis has been appointed Receiver by the United States Court at El Paso, Tex., in the suit brought by Royal Metcalf and Harry Boyle, two of the contractors for the grading.

Louisville, New Albany & Chicago.—That this road has been divided into two divisions, the Northern and Southern, has been previously referred to. The former division will include the line from Chicago to Indianapolis and from Michigan City to Lafayette, and the latter will include the line from Lafayette to Louisville, together with the Bedford and Bloomfield and French Licks Springs branches.

New Albany Belt & Terminal.—The following are the directors of this road: J. F. Gebhart, J. H. Stotsenburg, M. A. Weir, John Hieb, Henry Terstegge, S. A. Culbertson, Louis Hartman, Albert Trinler and W. A. Hedden. The officers are: President, J. F. Gebhart, and Secretary and Treasurer, S. A. Culbertson, of New Albany, Ind.

Newport News & Mississippi Valley Co.—H. E. Hunting ton has been appointed General Manager of this company's eastern division, with office at Cincinnati, O., the appointment to take effect May 1.

New York, Lake Erie & Western.—Robert M. Parker has been appointed Division Freight Agent in charge of the main line and branches east of Susquehanna. His office will be at the Pavonia Ferry, New York City. He succeeds F. D. Hunter, who resigned to accept the New York agency of the Commercial Express line.

Ohio Southern.—The annual meeting of the stockholders was held in Springfield, O., this week. The old board was re-elected with the exception of R. K. Dow, who was succeeded by E. H. Atkins, of New York, and H. H. Weekley was succeeded by A. J. Beckley, of Springfield.

Phillips & Rangeley.—At the annual meeting of the road held in Phillips, Me., last week, the following directors were elected: H. B. Closson, Calvin Putnam, Weston Lewis, A. B. Gilman, George L. Goodwin, Luther Nile, Heber Bishop, W. A. Rich and A. M. Spear. The directors chose these officers: President, H. P. Closson; Clerk and Treasurer, Fremont E. Timberlake; Manager, Wm. A. Rich.

Ripley & Mill Creek Valley.—At a recent meeting of the stockholders of the road, held at Ripley, Ky., the following Directors were elected: Warner Miller, John H. Riley, H. C. Flesher, J. M. Poling, B. F. Armstrong, G. J. Walker, T. E. Graham, J. R. Vail and John S. McKoun. The following officers were elected: President, John H. Riley; Vice-President, Henry C Flesher; Secretary, John S. McKoun; Treasurer and General Manager, Col. G. W. Thompson.

Rochester, Rensselaer & St. Louis.—At a meeting of the stockholders at Winamac, Ind., April 18, the following directors were elected: J. K. Lee, A. D. Toner, H. E. Pattison, J. B. Agnew, F. L. Wagner, J. S. Slick, W. C. Bennett, S. P. Thompson, A. J. Delong, W. H. Allen and B. Boland. J. K. Lee was elected President, A. D. Toner, Vice-President; William H. Bouselong, Treasurer, and John G. Holsinger, Secretary.

St. Paul & Duluth.—G. G. Haven, Jr., has been elected Secretary and Treasurer, vice Phillips Harris, resigned. W. H. Coleman has been appointed Assistant Secretary and Local Treasurer. A. V. Williams has been appointed Paymaster. Mr. Haven has been Assistant Secretary, with office in New York. His new office will also be in New York. Mr. Coleman, who succeeds him as Assistant Secretary, will have his office in St. Paul.

South Bound.—C. R. Woods, of Savannah, and Hon. Alfred Aldrich, of Barnwell County, S. C., have been chosen directors to fill vacancies, and William S. Tison has been elected President and J. F. Thomson Secretary and Treasurer. Hermann Myers, President, and B. A. Denmark, Vice-President of the railroad, have resigned, and have been elected President and Secretary and Treasurer, respectively, of the Construction Company, both with office in Savannah. M. Brown, of Barnwell, S. C., has been elected General Manager.

South Pennsylvania.—The road was reorganized in Reading, Pa., last week. George F. Baer, Reading, was elected President, and Francis L. Stetson, Francis L. Bangs, and Charles MacVeagh, all of New York; James N. Mohr, Philadelphia; Jefferson Snyder and F. C. Smink, Reading, were chosen directors.

Tennessee, Arkansas & Texas.—The first Board of Directors is as follows: Hugh L. Brinkley, of Memphis; Z. Ward and J. H. McCarthy, of Little Rock; W. J. Little, of Hot Springs, and D. H. Scott, of Paris, Tex. Z. Ward, of Little Rock, is President of the construction company.

These officers were elected: Hugh L. Brinkley, of Memphis, President; D. H. Scott, of Paris, Vice-President, and J. H. McCarthy, of Little Rock, Secretary and Treasurer.

The Dallas & Southern.—The incorporators of this company are: Robert Mays, S. R. Adams, C. L. Phillips, A. S. Macallister, D. W. French, C. C. Hobart, P. T. Sharp, W. D. McLewis, Charles Hilton, O. D. Taylor, C. W. Decket; H. Beale, J. S. Shunch, E. B. McFarland, George W. Felloon, I. C. Nichelsen, H. Glenn, M. Vogl, C. J. Crandall, R. F. Gibson, E. Schanno, J. W. French and George Ruch.

Utah Central.—T. J. Mackintosh, late Chief Clerk of the Union Pacific at Salt Lake City, has been appointed General Freight and Passenger Agent and Auditor of this system.

West Virginia Central.—The annual meeting of stockholders of the West Virginia Central Railway Co. in Maryland was held in Baltimore April 22. The following officers and directors were elected for the ensuing year: President, William H. Gorman; Secretary, Maj. E. W. S. Moore; Directors, H. G. Davis, A. P. Gorman, W. H. Gorman, S. B. Elkins, E. W. S. Moore, William P. Whyte and Frederick B. Lott.

RAILROAD CONSTRUCTION,

Incorporations, Surveys, Etc.

Abbeville & Tifton.—Application has been made in Georgia for a charter for this road, which is to extend from Abbeville southwest about 40 miles to Tifton. An extension is projected from Abbeville northeast to Dublin, about 45 miles, but a charter for this division has not been applied for.

Abbeville & Waycross.—The grading on this line has been completed for about six miles from Abbeville, Ga. S. P. Lassiter, President of the Abbeville Improvement & Construction Co., which has the contract for building the road has ordered 56 lb. rails for 12 miles of the road from Henry Levis & Son, of Philadelphia, and when these arrive the tracklaying will be commenced.

Allentown Terminal.—The company has been asked to build a branch from Allentown, along the Cedar Creek Valley to Shantyville, Pa., four miles. Most of the right of way has been already granted.

Arkansas & Gulf.—The contract for building this road between Pendleton, Ark., and the Louisiana state line in Chicot County, 85 miles, was announced to be let during February. The award was postponed at that time, however, but the officers of the road now claim that the work will be let in June and the rolling stock ordered in July. The grading will be light, the maximum grade being 25 ft. to the mile. W. R. Berg holz, 15 Cortlandt street, New York City, is President.

Atlanta, Alpharetta & Blue Ridge.—The survey will probably soon be commenced from Atlanta through Roswell to Alpharetta, Ga., and north about 20 miles. Col. B. F. Abbott is President.

Atlanta, Asheville & Baltimore.—Chester County, S. C., has voted a subscription of $100,000 to the capital stock of this line, to be paid when it has been completed from the Broad River through Wilkesburg and Chester, S. C., to Mount Dearborn, on the Catawba River.

Baltimore, South Baltimore & Curtis Bay.—It is stated that the contract for building this short Maryland road will be let in about a month. Its incorporation was referred to last week. The road is to extend from South Baltimore, north by a bridge across the Patapsco River, into the city of Baltimore. South Baltimore is a new manufacturing point, on Curtis Bay, about two miles south of the southern city limits of Baltimore. W. S. Raynor, 8 East Lexington street, Baltimore, is a director.

Bayard, Petersburg & Moorefield.—This road, which has been recently chartered in West Virginia, as stated last week, is to extend from Bayard, on the West Virginia Central & Pittsburgh, southeast to Moorefield, Hardy County, W. Va., a distance of about 25 miles, and thence to the state line. The capital stock is placed at $1,000,000.

Bay City & Battle Creek.—A mortgage for $1,800,000 from the road to the Metropolitan Trust Co., of New York, has been filed in Calhoun, Barry, Eaton, Ionia, Clinton, Montcalm and Gratiot counties in Michigan. Bonds to the amount of $15,000 a mile are to be issued as the road is built. The line from Bay City to Midland is partly finished, and work on the remainder will, it is stated, soon be resumed.

Birmingham, Sheffield & Tennessee River.—Dunn Bros., of Birmingham, Ala., have the contract to build the Riverton extension of this line from Margerum to Riverton, Ala., 11 miles, which has been previously referred to.

It is stated that a survey is being made for an extension from Jasper to Bessemer, and thence to Birmingham, Ala. The road connects at present with the Kansas City, Memphis & Birmingham at Jasper, and this gives it a Birmingham connection.

Bridgeport & Decatur.—The locating survey for this line, which has been referred to as the Decatur & Bridgeport, has been completed, and the contract for grading will probably be let within 60 days. The line is to extend from Decatur to coal mines in Wise County, Tex., near Bridgeport, which are owned by the Bridgeport & Decatur Coal & Mining Company. The length of the line as at present located is 12 miles, but it is proposed to extend it further in the future. The work will be light, averaging about 13,000 yards of excavation and embankment per mile. The maximum grade is 1½ per cent., and the maximum curves 1½ degrees. The bonds of the company will be guaranteed, principal and interest, by the coal company. The coal lands of the latter company are 1,800 acres in extent, and it is now working a 30-in. vein of bituminous coal. J. J. Lang, of Decatur, is President, and William Bradlum, of Marshall, is Chief Engineer.

Bridgeport Southern.—Articles of incorporation wer filed in Alabama last week by this company, which is to construct a road from Bridgeport, in Jackson County, to Guntersville, Marshall County, following the Tennessee River and passing through Tobin and Langston, in Jackson County, and Hillion's Store and Meltonville, in Marshall County. The capital stock is $1,000,000.

Brunswick, Lake City & Tampa.—This company has been incorporated in Georgia to build a road about 35 miles long from Lake City northwest to the Georgia state line. The capital stock is $100,000. The incorporators are the same as those of the Lake City & Tampa, which was chartered last month.

Burkesville & Northwestern.—The survey for this road was begun last week by H. A. Genung and nine assistants. Two routes will be surveyed, as mentioned in our issue of March 28, the first to Horse Cave, 50 miles, and the other to Glasgow, 58 miles.

Burlington & Missouri River.—The road is to be extended five or six miles from Lyons, Colo., to the company's stone quarries.

Calgary & Edmonton.—Three engineering parties commenced the survey of this road between Calgary and Edmonton, Alberta, 210 miles, last week. The work is in charge of Alexander Stewart. One line is to be run from Nose Creek north toward the Red River; another on the northern section between the Red River and Edmonton and another line will be run north from the Battle River.

Canadian Pacific.—The General Superintendent of the Pacific division is reported as stating that the company intended to establish an alternative line west through Crow's Nest Pass, which would connect with the present line at Hopetown, in British Columbia. Two hundred men have been ordered to proceed to Revelstoke, B. C., to work on the branch to be built between the Columbia River and Kootney Lake.

A survey is being made by engineers of this company for the Manitoba Southwestern Colonization road from Glenboro, Man., toward Plum Creek.

Cape Fear & Yadkin Valley.—About 430 convicts are grading the extension from Mt. Airy, N. C., to the Virginia line, where a junction will be made with the extension of the Norfolk & Western, now being built south from Ivanhoe, Va. This extension is 8¾ miles long and is to be completed by Sept. 1. Three miles of grading has been finished. The grading on the Granite branch has been completed and the trestles and bridges are being constructed. Tracklaying will shortly begin. This branch is two miles long from Mt. Airy to the Mt. Airy Granite Co. quarries.

Chattanooga Southern.—W. C. Durand, of Oneida, Tenn., is said to have a contract for constructing 20 miles of this road.

Chicago & Eastern.—This is the Illinois division of the Toledo & Western referred to last week, which proposes to build a new road between Toledo and Chicago. The line of the Illinois company is to extend from Chicago through Cook County to a point on the state line between Illinois and Indiana, where it will connect with the Indiana & Northern. The capital stock of the new road is $100,000.

Cincinnati, Lebanon & Northern.—The directors have voted to change the road to standard guage between Cincinnati and Dodds, O., 36 miles. The work is to be commenced at once.

Cleveland Belt Line.—The charter of this company was filed at Columbus, O., last week by officers of the Cleveland & Canton. The road is a revival of a project organized about two years ago, the charter for which had nearly expired by limitation. It is not believed that the incorporators have any intention of building the line at the present time.

Columbia, Newberry & Laurens.—The tracklaying on the 43 miles between Columbia and Newberry, S. C., has been completed to within 10 miles of Prosperity, on the Richmond & Danville. Some grading is now being done between Prosperity and Newberry, six miles, but this will be finished by the time the track has been laid to the former point.

Delaware, Lackawanna & Western.—C. F. Mairs, of New York, has been awarded a contract for building an extension of the Passaic & Delaware Division from Bernardsville, N. J., west to Peapack, N. J., 7¼ miles.

Deming, Sierra Madre & Pacific.—The tracklaying was begun at Deming, N. M., last week by the Rosenfield Construction Co., of Denver, which has the contract for tracklaying south to the Mexican border, about 40 miles.

Diamond Valley.—An extension of this line from Morrisville, north about five miles, to large iron mines, is said to be under consideration by the officers of the company.

Dublin & Abbeville.—This company has applied for a charter in Georgia to build the road between Dublin and Abbeville, Ga., about 40 miles. The capital stock is $50,000.

Dutchess County.—The articles of incorporation of this company were filed in New York this week. The proposed road is 12 miles long, and will extend from Poughkeepsie, in a southeasterly direction, to a point on the New & York New England, near Hopewell junction. The capital stock is $300,000. Among the directors are several who were interested in the construction of the Pennsylvania, Poughkeepsie & Boston, during its construction.

Gulf, Colorado & Santa Fe.—It is reported that the company will soon put a surveying corps in the field for a line from Alvin, between Houston and Galveston, to Velasco, Tex., at the mouth of the Brazos River.

Gulf, Brazos Valley & Pacific.—The subsidy asked of Henrietta, Tex., $1,000 per mile and right of way from the Red River to the Jack County line, has been raised and the survey is now in progress from that point south of Mineral Wells through Secret Springs, Buffalo Springs, Post Oak and Jacksboro. When this survey is finished the location will be made. There is an easy line between Henrietta and Jacksboro, but between Jacksboro & Mineral Wells it is more difficult. It is claimed that 150 teams will be put on the grading at Henrietta when the location has been completed. Rails for the line have arrived at Mineral Wells and Henrietta, and the track will be laid from both these points.

Highland & St. Joseph.—It is expected that grading on this line, whose incorporation was noted last week, will be commenced in June. It is to extend from Highland to Ryan's Station, Kan., on the St. Joseph & Grand Island, 7½ miles. Haines Bros., who are building several short lines in Texas, have the contract. Their office will be at Rockport, Mo. The capital stock is $60,000, and of this $35,000 was subscribed by Haines Bros. and $25,000 by local people.

Houston & Texas Central.—The grading has been nearly completed on the branch from Hutchins to Lancaster, Tex., five miles, and the tracklaying was begun last week. John O'Keefe, of Dallas, Tex., has the contract.

Indiana Northern.—This road is the Indiana division of the Toledo & Western, and was referred to last week. The articles of incorporation have been filed, and provide for a line through the counties of Steuben, La Grange, Elkhart, St. Joseph, Laporte and Lake. The length of the road is about 150 miles, and the capital stock is placed at $500,000. G. G. Hadley, of Toledo, and T. J. Cullen, of Indianapolis, are directors.

Ivorydale & Mill Creek Valley.—An officer sends us the following account of this road: The tracks and right of way owned by this company were built and were formerly owned by Proctor & Gamble, being constructed entirely for their convenience. For the convenience of the railroads that have connections with its tracks and for the accommodation of manufacturing firms doing business in the neighborhood, the road has been doing a considerable amount of switching. As the demand for this service was increasing, it was thought advisable to incorporate, so that equal service could properly be rendered for all at fair rates. The tracks so far constructed lie entirely within the limits of Ivorydale, and connection is had with the C., H. & D., and C., C., C. & St. Louis roads, and there will soon be a connection with the Baltimore & Ohio Southwestern. It is not the intention to extend the road beyond Ivorydale at the present time, but an extension may be built in the future

Jacksonville Southeastern Line.—E. M. Collins, of Edwardsville, Ill., has the contract for grading the St. Louis division from St. Litchfield through to East St. Louis, Ill., 48 miles. He has a large force at work, and will probably have the first 28 miles from Litchfield graded by May 1. It is expected to have the entire division ready for operation by July 1.

Kanona & Prattsburg.—This road is to be extended from Prattsburg north about 20 miles to Stanley, N. Y., on the Northern Central, and thence to Geneva, on the Lehigh Valley, about 10 miles further. An extension from the southern terminus at Kanona west to Hornellsville, about 18 miles, is also proposed. The company has issued first mortgage five per cent. 50-year bonds to the amount of $192,000 at the rate of $16,000 per mile on 12 miles of road. The Farmers' Loan & Trust Co., of New York, is trustee of the mortgage.

Kentucky Roads.—A bill has passed the State Legislature to incorporate the Paducah Southern & Jackson road. Bills have also been introduced to incorporate the following companies: Danville & Louisville, Salyersville, Prestonsburg & Norfolk, Elkhorn & Pineville, Prestonsburg & Southern, Princeton Belt, Lebanon and North & South, and the Williamsburg & Middleboro. Bills to amend the charter of the Buffalo & Hodgenville, Paducah, Cairo & Southwestern, and the Charleston, Kentucky & Western roads have also been passed.

Lincoln & Western.—A construction company has been organized to build this road, which was recently chartered by members of the Board of Trade of Lincoln, Neb. The line is to extend from Lincoln west, crossing the St Joseph & Grand Island at McCool Junction, and the Fremont, Elkhorn & Missouri Valley at Beaver Crossing and Henderson, to Prosser, on the Missouri Pacific.

Louisville, New Orleans & Texas.—The grading on the Tallahatchie branch has been completed and tracklaying will be commenced May 1.

Memphis & Atlantic.—J. E. Carothers, of West Point, Miss., has the contract for the section now under construction from West Point to Abbott, Miss., 10 miles. The contract for the next section from Abbott northwest to Houston, Miss., about 21 miles, will be awarded within the next 30 days. The company has asked Houston to vote $30,000 in town bonds toward the project. It is stated that the contract will be let during the summer for the entire division to Memphis, Tenn., a distance of 120 miles from Houston. The contract for the division between West Point and Tuscaloosa, Ala., will not be let before next fall. F. M. Abbott, of West Point is President.

Mexican Roads.—The President of the Republic in his message refering to the lines now being built, gives the following information. Active work has been done on the Cordoba & Tuxtepec Agricultural road, and in 14 months 37 kilometres, including heavy bridge work and tunneling, have been completed. On the Mexican Southern (Puebla to Oaxaca), 149 kilometres of embankment, between the cities of Puebla, Tehuacan and Tecomavaca, have been completed. Large quantities of material have arrived and the line will soon be placed in working order. The Mexican Pacific has begun work energetically on the line which will connect the remote state of Chipas with that of Tabasco, by means of a line between the ports of Tonalá and Frontera. The company has begun work at the port of Tonalá by building a pier 274.2 metres long, which is already in use. Work on the Tehuantepec Isthmus road is progressing steadily. At the southern end the line has reached the Chivela Pass, where three tunnels are being driven.

On the Maravatio & Iguala line 45 kilometres have been completed, and work is advancing on this line, which will serve important mining districts. The concessionaire of the Northwestern road in the Valley of Mexico, running between the City of Mexico and Tizayuca, where it will connect with the Hidalgo road, has completed the tracklaying for 31 kilometres, and the grading to near the capital. The concessionaire of the Valley of Mexico line has completed 13 kilometres between Mexico and San Angel via Tacubaya and Mixcoac.

Preparations are being made to begin work on the new road between Aguas Calientes and Chamela, on the Pacific coast, under the Gonzalo Esteva concession. The contracts for the building of the road will probably be let about May 1.

Middle Georgia & Atlantic.—King Bros., of Indiana, are said to have the contract for the section between Covington and Machen, Ga.

Missouri, Kansas & Texas.—It is claimed that the contract has been let for the extension from Denison to Sherman, Tex.

It is stated that contracts will be let by May 20 for an extension southwest from Henrietta, Tex., paralleling the Wichita Valley road. The survey is to begin by May 5.

Missouri Pacific.—The grading has been completed for about 10 miles from Fort Scott, Kan., on the Fort Scott & Eastern road, which is being built from that point northeast through Rich Hill, Mo., to Liberty.

Missouri, Tennessee & Georgia.—The engineers have completed the locating survey from Humboldt, Tenn., west toward Hopkinsville, Ky., for 25 miles, and the profiles and estimates are being made. E. P. Buell & Co., of Tarlton, O., who have the contract for the entire line, are to begin grading on this section at once.

Morristown & Cumberland Gap.—The survey for this road is still in progress, but it will probably be completed and construction begun by May 15. The contract has not yet been awarded, but it will probably be let to Allison Shafer & Co., of Chattanooga. J. J. Martin, of Morristown, Tenn., is a director.

New Albany Belt & Terminal Co.—The city council of New Albany, Ind., has revoked the right of way along the river front which was granted the Louisville, New Albany & Chicago several years ago, and has passed an ordinance giving permission to this company to construct a road through the city over the same route from Vincennes street to West Third street, connecting the Ohio & Mississippi road and the Louisville & St. Louis Air Line with the Kentucky & Indiana Bridge. The road is to be an elevated structure similar to the Louisville Short Route on Water street, in Louisville. J. F. Gebhart, of New Albany, is President.

New Roads.—Major J. J. Lucas, of Society Hill, S. C., is the projector of a proposed road from a connection with the Atlantic Coast line at Society Hill northeast to Bennettsville, the southern terminus of the Cape Fear & Yadkin Valley. The distance is about 11 miles. It is believed that the line can be constructed for $30,000 if the present bridge over the great Pee Dee River is used, but if this cannot be done the cost of a new bridge over that river and the necessary trestling will probably increase the amount to $130,000.

W. F. Hill, of Hendersonville, N. C., will soon begin the survey for a proposed road from Smithsonia, Oglethorpe County, Ga., about four miles north, to a connection with the Georgia, Carolina & Northern. A survey will also be made to Sandy Cross, about 10 miles distant. The road will be a private line, and will be built by James M. Smith, of Smithsonia.

A charter is to be applied for in Georgia to build a road from Danielsville south about eight miles, to connect at a point west of Elberton with the line of the Georgia, Carolina & Northern, now building. An abandoned grade of the Augusta & Chattanooga road will be used. This will require but little repair. George F. Daniel and R. Russell, of Danielsville, are interested.

A project for building a road from McDonough, Ga., on the Georgia Midland & Gulf north through De Kalb County, via Clarkson, to Doraville, about 25 miles is agitated. The Georgia Midland & Gulf will be asked to build the extension, and as its refusal is anticipated, it is asserted that an independent company will be organized.

The contract has been let for the proposed road between Corpus Christi and Brownsville, Tex. The latter town has voted $160,000 to the enterprise.

F. H. Holloway, of Burnet, Tex., contemplates constructing 35 miles of standard gauge road and a bridge about 420 ft. in length.

New York & New England.—The Rhode Island Legislature has passed a bill which allows the Rhode Island & Massachusetts, a leased line of this company, to issue new bonds to the amount of $1,500,000, the proceeds to be used in building an extension from Valley Falls into Providence to the new passenger station in that city. The line is to be double tracked between Franklin, Mass., and Providence. A similar bill to that just passed by the Rhode Island State Legislature is now before the Massachusetts Legislature.

Northern Pacific.—The town of Anacortes, Wash., has voted to grant this company 500 acres of land in and near the town if the road will extend its Central Washington Branch to Anacortes, on Puget Sound. One of the officers states that the line will be built through the Skagit Pass of the Cascade Mountains, and thence up the Skagit River to Puget Sound. He also states that work will be begun by July 1, and that the extension will probably be completed to Anacortes by Nov. 1, 1891.

Northern Pacific & Manitoba.—When construction was suspended last year the Morris & Brandon extension had been completed to within five miles of Brandon, Man. Tracklaying was resumed on this section this week and it will shortly be completed.

Norfolk & Western.—Tracklaying has been begun on the extension south from Ivanhoe, Va., to the state line to connect with the branch of the Cape Fear & Yadkin Valley, from Mt. Airy, N. C. The distance to the state line is 40 miles. The first 14 miles from Ivanhoe has been graded. G. T. Mills, of Pulaski, Va., is the contractor on the first 16 miles from Ivanhoe.

Olympia & Chehalis Valley.—It is stated that the Oregon Improvement Co. has purchased this road, and will extend it south six miles to Cherry Hill, Wash., and to other points, and also change the gauge to standard. The road extends from Olympia to Temno, 15½ miles, and is of 3-ft. gauge.

Olympia, Sherman Valley & Gray's Harbor.—This company has been recently incorporated in Washington by George B. Shannon, B. Turner, Frank I. Blodgett and others, to build a road through an extensive lumber district from Olympia westerly to Gray's Harbor, about 40 miles.

Omaha, Hutchinson & Gulf.—Tracklaying was commenced at Anthony, Kan., April 17, and is in progress south toward the state line, which it is expected to reach by June 1. Rails for 50 miles have been delivered at Anthony. S. C. Darrough, of Anthony, and W. Hutchinson, of Hutchinson, are directors.

Omaha Southern.—The right of way has been secured for this road from Union through Cass County to Plattsmouth, Neb., and the Platte River. Several towns in Cass County have been bonded to aid the project. J. M. Patterson, O. H. Ballou, A. B. Todd, W. S. Wise, William Neville, A. N. Sullivan and F. M. Richey, of Plattsmouth, are members of the local committee.

Oregon Railway Extension Co.—The company is empowered to build the following lines in the supplementary articles of incorporation, referred to last week: Portland to Astoria, 100 miles, with a branch from Columbia City to Forest Grove; Alto station, in Columbia County, Wash., to Wallula, via Estes, a distance of 33 miles; Estes to Grange City, Wash., 22 miles; Uxas Ferry, Whitman County, Wash., to Dutch Flat, 85 miles; Centerville to Cold Springs station, Or., 35 miles; Pendleton to Heppner, Or., 40 miles; Umatilla to Pineville, Or., 165 miles, with a branch to Johnsbury, 100 miles, and another to the mouth of the Deschutes River, 120 miles; Walla Walla, Wash., to Butte, Mont., 450 miles; Lewiston to the mouth of the Little Salmon River in Idaho, 100 miles; La Grande to Wallowa Valley, Or., 70 miles, with a branch to Lewiston, Idaho, 60 miles; Walla Walla to Watsburg, via Mill Creek Valley and Dixie, 22 miles; Portland to Blaine, Wash., via Vancouver and Puyallop River, 29 miles, with branches in Washington as follows: In Lewis County, 90 miles; from the mouth of the Cowlitz River down the north bank of the Columbia River to the Pacific ocean, 72 miles; Olequa to the head waters of the Cowlitz, 90 miles; Centralia to Gray's Harbor, 65 miles; Tenino to Olympia, 18 miles; branches along the Nesqually River, 48 miles; along the Puyallup River, 52 miles; Puyallup River to Tacoma, 18 miles; from a point near the confluence of the White and Green rivers to the Northern Pacific, 22

miles; from the confluence of the Dawanish, White and Black rivers to Franklin, 24 miles; along the Snoqualmie and Snohomish rivers, 90 miles; along the Skagit River, 50 miles; along the Nooksack River, 45 miles; Port Townsend to Centralia, 120 miles; Elberton to Idaho, 40 miles; Connell to Seattle, 225 miles; Elgin, Ore., to the head of the Wallowa River, Ore., 60 miles; Baker City, Ore., up to the Powder River, 40 miles; Clarence to Silverton, Ore., 75 miles; Latah, Wash., to the Wenatchie River, Wash., 190 miles. Henry Failing is President and Joseph Simon is Vice-President, both of Portland, Or.

Oregon & Washington Territory.—It is stated that the merchants of Portland, Ore., have completed the subscriptions to the proposed bond issue of $2,000,000, which the company asked for an extension of its lines to Portland.

Pennsylvania.—J. M. Byers, Division Engineer of the Southwest Pennsylvania division, will award the contracts this week for the graduation, masonry, bridges, ballasting and tracklaying for about five miles of the Sewickley Branch, three miles of the Hecla & Mount Pleasant branch, and about two miles of the Turtle Creek Valley branch.

Plymouth & Middleboro.—The town meeting of Plymouth, Mass., will be held April 26, when some action on this scheme is to be taken. In anticipation the committee previously appointed to investigate the proposition has made a report. The town has been asked to vote $40,000 in bonds in aid of the road, as if built it will give it a southeastern connection independent of the Old Colony. The committee estimates the cost of the road at $325,000 and the operating expenses at $22,860 annually, which, added to $8,125, the interest on the bonds, makes $30,985 which it would be necessary to earn yearly. The committee places the yearly earnings at $28,650, in excess of the operating expenses, but not enough to pay the interest on the bonds. The inference is drawn that the road would fall into the hands of the Old Colony, and the town would lose by its investment.

Richmond, Nicholasville, Irvine & Beattyville.—J. J. Montague, of Owensboro, Ky., has been awarded a sub-contract for grading for 16 miles near Nicholasville, toward Versailles, Ky.

Rochester, Rensselaer & St. Louis.—At a meeting of stockholders in Winamac, Ind., last week, the contract for building the line was let to C. A. Benjamin, of New York. The road is to extend from Rochester, Ind., westerly through Winamac and Rensselaer to Gilman, Ill. J. K. Lee, of Winamac, is President.

St. Joseph.—The company has been organized with a capital stock of $100,000 by R. H. Wood, S. B. Allyn, John Ireland and others, of Rockport, Tex., to construct a road from the main land to the Aransas Pass via St. St. Joseph's Island.

San Antonio & Aransas Pass.—The grading is now in progress on the first 50-mile section from Houston, Tex., on the extension to Alexandria, La. The work has been hindered recently by the heavy rains, but it is now making satisfactory progress.

Santa Fe Southern.—The company has obtained all the necessary right of way for the extension from Santa Fe south to San Pedro, N. M., 46 miles. The locating survey has been completed for some time. It is expected that the grading will be begun at once.

Savannah, Americus & Montgomery.—It is stated that a survey has been made from the present eastern terminus at Stirling, southeast to Walthourville, Ga., on the Darien Short Line, a distance of 55 miles. The latter road is being built to Darien on the sea coast, and reaches a large timber district. It is understood that the right of way for the proposed extension has been secured as far as the Ohoopee River, near Reidsville, in Tattnall County.

Seattle, Lake Shore & Eastern.—The northern branch is now completed, ready for operation, for a distance of 32 miles north of Snohomish Junction, Wash. Thisleaves 24 miles to complete the road to the International boundary. The rails are laid to a point 19 miles north of Snohomish City. At Arlington, six miles north of the end of construction, the road enters the Stillaguamish valley.

Seattle & Montana.—The survey for the western section of this road was begun at Seattle, Wash., last week, under the direction of Mr. Watson, Resident Engineer. The line will be run north to Lake Washington and thence easterly toward the Cascade Mountains. A number of surveys have been made at several points in the Cascade Mountains by engineers of the Great Northern Road, but no pass has yet been selected.

Southern Pacific.—Among the numerous short branches in California, which it is the policy of the company to build, President Huntington states will be one through the Capay Valley, in Solano County. The surveys for this branch were made about three years ago.

An extension of the road will be built shortly from Rumsey to Clear Lake and from Esparto and Madison to Woodland, Cal. A branch from Winters, up Putah Creek, through Berryessa Valley, Napa County, into Child's Valley, is partially graded and will also soon be built.

South Florida.—A survey has been recently begun for a branch from Pemberton Ferry north to Floral City, Fla., about 15 miles. When the survey is finished a proposition for aid will be submitted to Floral City.

Tennessee, Arkansas & Texas.—The articles of incorporation of this company were filed in Arkansas last week. The company is to build a road from Little Rock to Paris, Tex., passing through the counties of Pulaski, Saline, Garland, Hot Springs, Montgomery, Clark, Pike, Howard, Polk and Sevier, in Arkansas, to the western line of the state at the east boundary line of the Choctaw Nation, I. T., a distance of 130 miles. It is proposed to purchase the Memphis & Little Rock and the franchises of the Paris, Choctaw & Little Rock. The capital stock is $2,000,000. To build the line the Memphis, Arkansas & Texas Construction Co. has been organized with a capital stock of $2,000,000, of which Z. Ward, of Little Rock, is President.

The Dalles & Southern.—The articles of incorporation of the company were filed in Oregon April 5. The object is to build a road from a point on the Columbia River, near The Dalles, via Tygh and Antelope valleys, to Prineville. The principal place of business is The Dalles, and the amount of capital stock is $1,000,000.

Umpqua & Coos Bay.—Nearly all the right of way has been secured for this road from Drain, Ore., on the Oregon & California road, through Elkton and Scottsburg to Reed, on the south side of the Umpqua River, near its mouth, and about three miles south of Gardiner. The distance is about 75 miles. The surveys have been made and the contract let to W. G. Steel, of Portland. B. C. Heald, of Drain, is the sub-contractor. At Reed the company has about 1½ miles of harbor rights and 1,000 ft. of water front for station and terminal grounds. An extension will be built from Reed south along the coast to Marshfield, on Coos Bay, about 35 miles. The grade on this division does not exceed 52 ft. to the mile. John C. Drain, of Drain, is President.

Union Pacific.—It is stated that if the present rate of progress of construction on the extension from Milford, Utah, is maintained, the line will be completed to Desert Springs, about 65 miles south of Milford, by June 20, and to Pioche, Nev., 35 miles further south, early in November. Tracklaying will probably begin by May 10. A large quantity of 56-lb. rails have arrived at Milford, but there has been a delay in obtaining the fastenings. The track will be laid by Kilpatrick Bros. & Collins, of Beatrice, Neb., who are also grading the line. The ties and rails will be furnished by the company. With the machine tracklayer, two miles of track will be finished daily. The construction work at the west end has been reduced by decreasing the number of tunnels from eight to six, the two being made open cuts. The main line will not run by Pioche, but will pass 30 miles to the east and turn south, the line to Pioche being a branch. The junction is 115 miles from Milford.

This road has secured control of the San Pete Valley line, which extends from Nelphi, south to Chester, Utah, about 20 miles. The road is to be changed to standard gauge and the proposed extension to Manti, about 17 miles, may also be built.

The Morrison branch of the Colorado Division is to be extended from Morrison westerly through Bear Creek Canon to Mt. Evans, Colo., one of the highest mountains in the state.

Waycross Air Line.—About 30 miles of this road in Georgia has been graded, and the track has been laid on 24 miles, and this section is in operation. The road has a charter from St. Mary's, Ga., on the Atlantic Coast, near Fernandina, Fla., northwest about 60 miles to Waycross, and also from Waycross to Macon and Cordele, Ga. About 100 men are now at work on the extension of the road. The work is light and it is an easy and inexpensive road to build. The maximum grade is 52 ft. to the mile, and the maximum curve is 4½ deg. The route is through one of the fine timber sections in Georgia. The company proposes to issue bonds to the amount of $15,000 per mile. Stillwell, Millen & Co., of Savannah, Ga., are the owners of the line. L. Johnson is General Manager and J. T. Stone is Chief Engineer, both of Waycross.

Weatherford, Mineral Wells & Northwestern.—It was again announced this week that arrangements had been made for the funds for building this road. It is to extend from Weatherford northwest about 15 miles to coal mines near Mineral Wells, Tex. The contract will be let next week, and grading at once begun. A mortgage has been executed to the Equitable Mortgage Co., of New York, on the road and the coal mines. I. R. Stone, of Weatherford, is President.

West Virginia, Pineville & Tennessee.—John T. Chels, the contractor for this road, has about 100 men grading the line between Pineville, Ky., and the Tennessee state line, at the forks of Straight Creek. It is expected to have this section completed by May 1. Proposals for 5,000 ties, to be distributed by June 1, have been advertised for. L. S. Fitzhugh, of Pineville, is Chief Engineer.

Wichita Valley.—The grading on this extension of the Denver, Texas & Gulf from Wichita Falls southwest to Seymour, Tex., 30 miles, has been completed for a distance of 20 miles, and the tracklaying has been finished on the first six miles. Half a mile of track is being laid daily, but recently the heavy rains have interfered with the work. It is expected that the road will be completed by July 1. D. Carey and A. S. Hayne, both of Fort Worth, Tex., are the contractors.

Woonsocket & Pascoag.—The city council of Woonsocket, R. I., has voted to guarantee the interest of an issue of five per cent. 20-year bonds of this company, amounting to $100,000. The proposed road is about 11 miles long, and it is stated that the New York & New England has agreed to lease the line when completed.

OLD AND NEW ROADS.

Baltimore & Ohio.—At the meeting of the directors last week President Mayer, in presenting the result of the business for the six months, stated that while it was gratifying as an evidence of the satisfactory condition of the company's business, he desired to remind the Board of the large expenditures now being made and required to be made for some time to come in improving the efficiency of the various departments of the company; that in the last six months, in addition to the regular expenses and fixed charges, the company had expended nearly $1,500,000 in construction and betterments (many of them permanent), including the acquisition of property and the payment for real estate acquired and used for several years, but heretofore in litigation. The income of the company, as far as it would go, has been used in these expenditures. For some time to come large expenditures must in like manner continue to be made, in order to place the system in the efficient condition necessary to economically conduct its affairs.

Vice President T. M. King has submitted to Cumberland, Md., a proposition to make it the termini of the second and third and Pittsburgh Divisions, to concentrate there the locomotive repair shops at Martinsburg, Keyser, Piedmont and Connellsville, effecting a change of 2,000 men, and also erect extensive shops and tracks in the eastern section of the city, making Cumberland and Baltimore the two largest repair points on the road. In consideration of this the city is asked to loan $150,000, to be repaid at the rate of $10,000 per annum without interest, the first payment to be made in two years. The company will expend the $150,000 received in erecting round-house, machine shops etc., and will secure the amount by a first lien on the property and the improvements. If the company should ever remove the shops, or cease operating them for six consecutive months, it is to repay to the city principal and interest.

Boston & Maine.—The terms of the consolidation of the Boston & Maine, Eastern and Portsmouth, Great Falls & Conway were published this week. The stockholders will vote on the plan May 8. The consolidation is to be effected upon a basis of $210 for Boston & Maine stock, $152 for Eastern, and $152.50 for Conway. The present Eastern stock, of which there are 31,496 shares, will become a Boston & Maine first preferred stock, entitled to dividends of six per cent. per annum. The present capital stock of the Boston & Maine is 70,000 shares, Eastern common, 49,976 shares, and Conway, 9,579 shares; a total of 131,479 shares. In the division of the new stock one share of Eastern takes $\frac{3.3.3}{1.0.0.0}$ of the new Boston & Maine; one share of Conway, $\frac{7.3.3}{1.0.0.0}$ of the new, while the holders of each 6¾ shares of the present Boston & Maine stock will receive one new share additional, or 7⅓ of the consolidated road stock. There are 5,000 shares of the stock of the Conway road in the treasury of the Eastern, which will become the property of the consolidated road.

Buffalo, Rochester & Pittsburgh.—A circular has been issued by Adrian Iselin, Jr., President of the company, informing the stockholders that Adrian Iselin, Sr., has sold $4,000,000 worth of the stock he owned, and therefore no longer controlled the company. The conditions under which the sale was made include the placing of $1,250,000 in the hands of a Trustee, to be used for the purpose of building a road from Howard Junction to Clarion Junction, Pa., a contract by which the Rochester & Pittsburgh Coal & Iron Co. obligates itself for 100 years to ship all the products of its mines and lands over the road. Also a contract with the Bell, Lewis & Yates Coal Mining Co. to ship over the line for the next five years not less than 500,000 tons annually, paying as freight a minimum rate of $1 per ton from Reynoldsville to Buffalo and $1.15 from the same point to Rochester; the output of the Rochester & Pittsburgh Coal & Iron Co. to be 35 per cent. and that of the Bell, Lewis & Yates Coal Mining Co. to be 65 per cent. of the total amount of coal mined by both companies for sale. But the output of the Rochester & Pittsburgh Coal & Iron Co. is to be not less than 750,000 tons a year. It is stated that $1,250,000 bonds are reserved for building the extension to Clarion Junction.

Chicago, St. Louis & Pittsburgh.—Official announcement has been made of the consolidation of the Cincinnati & Richmond, the Cincinnati, Richmond & Chicago, and the Richmond & Miami, owning the road between Rendcomb Junction, Ohio, and Richmond, Ind., into a new corporation with the title of "The Cincinnati & Richmond Railroad Company," taking effect April 1, 1890. The line of road thus consolidated will continue to be operated by the Chicago, St. Louis & Pittsburgh, and will be known as the Cincinnati & Richmond Division, and the operating accounts kept accordingly.

Columbus & Maysville.—The Circuit Court of the United States for Southern Ohio has ordered the sale of this road at Columbus, May 5. The sale is ordered in the suit brought by the Central Trust Co. of New York. The road is being operated by the Ohio & Northwestern between Hillsboro and Sardinia, O., 19 miles.

Columbus Southern.—The Chattahoochee Brick Co., of Atlanta, Ga., which built this line, and which has been operating it, transferred it this week to the railroad company for operation between Columbus and Albany, Ga., 87 miles. S. F. Parrott, of Columbus, is General Manager.

Detroit, Charlevoix & Escanaba.—Thomas Rock, of Chicago, has brought suit in the United States Court at Grand Rapids, Mich., against the Chicago & West Michigan and the Toledo, Ann Arbor & Northern for $40,000. He had the contract for grading this road between Charlevoix and Petosky, Mich., and claims that the amount mentioned is due him. The road has never been built, and he claims that the franchise is owned by the two roads he brings suit against.

Grand Trunk.—Sir Joseph Hickson, general manager, states that he knows nothing about the reported agreement being entered into between the Grand Trunk and Northern Pacific roads for the construction of railroads in Manitoba and the Northwest, and he denies that the Grand Trunk is making arrangements to construct any lines in that part of the Dominion.

Illinois Central.—The earnings from traffic for the nine months ending March 31, 1890 and 1889 (March, 1890, estimated), were as follows:

	1890.	1889.	Inc. or Dec.	
Aver. miles oper.	2,275	2,060		215
Gross earn	$11,174,134	$9,659,161	I.	$1,515,033
Oper. expen. taxes	6,967,522	5,985,883	I.	981,643
Per Impr. paid from income	203,742	204,042	D.	300
Total	$7,171,268	$6,189,925		$981,343
Net earnings	$4,002,866	$3,469,176		$533,690

The Dubuque & Sioux City reports its gross and net earnings for the nine months ended March 31, 1890 and 1889, as follows (March, 1890, estimated):

	D. & S. C.		C. F. & M.	
	1890.	1889.	1890.	1889.
Miles	524	524	76	76
Gross earn.	$1,479,669	$1,361,528	$70,264	$73,342
Oper. expen. taxes.	1,082,754	1,063,177	117,459	85,475
Net earnings	$396,915	$301,351	df. $47,195	df. $12,133

	Both roads.		
	1890.	1889.	Increase.
Miles	600	600	
Gross earn	$1,549,933	$1,437,870	$112,063
Oper. expen. taxes	1,200,213	1,148,652	51,561
Net earnings	$349,720	$289,218	$60,502

The Dubuque & Sioux City has also expended on permanent improvements $116,850, which has been charged to capital account. The amount so spent and charged for the corresponding period in 1888 and 1889 was $107,223.

Jacksonville Southeastern.—The sale of this road under foreclosure proceedings will take place at Salem, Ill., May 10. The complainant in the suit is the Pennsylvania Mutual Insurance Co., and it involves the issue of $1,000,000 first mortgage bonds.

Lehigh Valley.—An opinion in favor of the defendant was handed down at Harrisburg, Pa., this week in the case of the state against the company, an appeal from re-settlement for tax on capital stock. The state's claim was $744,000, being taxes from 1875 to 1887 inclusive. The court holds the defendant is not required to pay tax upon that portion of its stock represented in the New Jersey section. An opinion was rendered, however, by which the company must pay $52,255 for back taxes.

Louisville, New Orleans & Texas.—At a special meeting of the stockholders of the Natchez, Jackson & Columbus, in Natchez, Miss., April 15, the sale of this road and its franchises and property to the above com-

pany was ratified. The stock of the road has been canceled and the purchasing company has assumed all obligations and indebtedness.

Manhattan (Elevated).—Drexel, Morgan & Co., of New York City, offer at 96 and interest, $6,000,000 of the consolidated mortgage four per cent. 100-year gold bonds. Interest is payable without deduction from either interest or principal for any taxes which the company may be required to pay by any laws of the United States or of the state of New York. The bonds are part of the amount appropriated to provide for the payment of land damages, the acquisition of real estate, and the equipment and payment of the floating debt and further development of the property.

Missouri, Kansas & Texas.—In the United States District Court at Topeka, Kan., Judge Foster has, on application of the Union and Mercantile Trust companies of New York, ordered the sale of the road, under mortgages held by the trust companies. The foreclosure of the mortgages had been amicably agreed upon and the proceedings consisted merely of the formal entry of the order.

New Castle Beaver Valley.—A suit, involving over $300,000, brought by this company against the Pittsburgh, Fort Wayne & Chicago and the Pennsylvania Co., was commenced at Youngstown, O., April 15. The plaintiff claims there is due it under a lease executed in 1865, in addition to what has been paid, the sum of $309,231. An accounting is asked. The defendants make a general denial of any indebtedness.

New York, New Haven & Hartford.—The Connecticut State Railroad Commissioners have decided in favor of the company, the case concerning right of way in Westport. In making the layout for the proposed four tracks through Westport, the company was unable to purchase needed land, and asked the Commissioners to condemn it. The owners filed an answer, alleging that by the provisions of its charter the company had no right to construct a four-track road in the state. The company claimed that a special law of 1882 gave power to all roads to lay as many tracks as might be deemed by the Commissioners necessary for public convenience. This claim has been sustained by the Commissioners.

Philadelphia & Reading.—The Pennsylvania has filed in the Common Pleas Court at Philadelphia its answer to the Reading's bill of complaint, asking for an injunction to prevent the arbitration of any differences between the two companies arising under the agreements of June, 1887. Under these agreements the Philadelphia & Reading agreed to furnish the Pennsylvania's Schuylkill Valley division, 1,000,000 tons of anthracite coal per year, to be delivered in the mining regions. The Reading has asked that the agreements be declared void, for the reason that the Pennsylvania has failed to carry out those provisions which it consented to in the agreement.

The following is substantially the account of the litigation as published in the Baltimore *Sun* in a Philadelphia dispatch. To begin with, the Pennsylvania built the Schuylkill Valley line at great loss to cripple the Philadelphia & Reading, in which it succeeded, though it could get little coal tonnage, except by consent of the Reading, which controlled the mines. In 1887 the two companies made an agreement not to invade each other's territory. The Reading was to get a peace which would permit its reorganization; the Pennsylvania was to get 1,000,000 tons of coal per annum for transportation over its Schuylkill Valley line, it being understood that this coal was to go to non-competitive points. Neither company appears to have paid any attention to the agreement. The Pennsylvania sent Reading's coal down to Baltimore and Washington, where it cut prices 50 cents per ton to hurt the Baltimore & Ohio. The Reading then refused to deliver more than about 300,000 tons per annum instead of 1,000,000. This is the foundation of the Pennsylvania's claim for damages. The Pennsylvania began the construction of its Downingtown-Trenton road, but claims that this was not primarily to compete for local traffic. The Reading, it is charged, has diverted traffic from the Junction Railroad to the Schuylkill Valley East Side road (B & O.) in violation of the agreement, and is now building a competing road to Cape May. The Pennsylvania prevented the Reading from extending its terminal road to Market street but claims that this was not a violation of amity, as the road, if built, would interfere with a road surveyed for itself. The Reading is also charged with bad faith in letting the Baltimore & Ohio through to New York after its president had made a verbal agreement to break the contract with the B. & O., which was held to be illegal. That is the quarrel as it stands. It is not expected that the equity suit will settle it.

South Pennsylvania.—The property was recently bought at foreclosure sale by G. F. Baer, of the Philadelphia & Reading Coal & Iron Co., and he has been elected President of the reorganized company. But the reorganization does not foreshadow an immediate construction of the road. It clears the property of all litigation and outside complications and leaves it in the control of the Vanderbilt interest. Nothing, however, has been decided upon as to whether the road shall be built, and while the directors decline to make official statements, it is understood that no changes will be made in the status of the property, which now exists simply as an asset to represent the money sunk in the enterprise six years ago.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, April 23, 1890.

The various meetings of the month have adjourned without having improved the existing situation in the least; in some respects it is more serious than a week ago. How long the present state of affairs can last is problematical, but many of the managers are still hopeful that the tide is about to turn. The only reason the roads are not being more rapidly forced to a point where the resulting loss of revenue must compel a halt is the fact that business is exceptionally good, and with a large volume of traffic it is possible for most of the lines to continue in the fight for some time yet, sustaining their revenues as much as possible from traffic not seriously affected by the reductions. All efforts to patch up a temporary truce have been abandoned, as it is evident that the prime movers in the fight will consent to no restoration of rates or reorganization until it can be done "all along the line." The cut in passenger rates from Kansas City to Colorado points, noticed last week, was of short duration, the rate being promptly restored to the $7.50 basis by all lines. An absurd newspaper "fake" was current that the cut was started through the action of one of the local agents in perpetrating a "joke" on his neighbors. The officers of the Atchison deny any intention of making a $5 rate from Kansas City to Galveston, which would be a reduction of about $20, and would compel the Missouri Pacific to lower its local rates along an exceedingly profitable line.

The Chicago, Milwaukee & St. Paul is to open its new "Hedrick route" on May 11, with vestibule trains between St. Paul and Kansas City, and through cars between St. Paul and St. Louis. The route is from St. Paul to Mason City over the Chicago, Milwaukee & St. Paul; Mason City to Hedrick over the Iowa Central; Hedrick to Kansas City over the Chicago, Milwaukee & St. Paul. Connection is made at Ottumwa with the Wabash for St. Louis. The running time between St. Paul and Kansas City will be about three hours less than by any existing route.

The Wabash has met the Alton mileage rebate to cattle shippers by reducing the present 9-cent cattle rate, St. Louis to Chicago, to 6¼ cents.

At the March meeting of the Trans-Missouri Freight Association the Chicago, Rock Island & Pacific took an appeal to the Executive Board of the Interstate Commerce Railway Association on its application to reduce the rate on tallow in carloads from Denver to Missouri river points to 50 cents per 100 lbs., the present rate being 75. The appeal was heard by Chairman Walker who has now rendered a decision adverse to granting the request, in which he says:

"The present proposition is to reduce the east-bound rate on tallow because of a reduction on the west-bound rate on soap. When the latter proposition was before me I disapproved it upon the ground that the making of commodity rates was objectionable except in cases of very special urgency, and that the making of the rate would establish an unfortunate precedent, no satisfactory reasons therefor being shown. I remain of that opinion. . . . The true remedy for the commercial inequality would be the restoration of soap to its place in Class 5. . . . No reasons have been shown that seem to warrant introducing this new exception to the classification. Every change in that direction is the fertile parent of others of like nature."

A new bidder has appeared at Chicago for export grain traffic. It is a boat line which operates by lake to Ogdensburg, and thence to Montreal by St. Lawrence river barges. The Ogdensburg Transit Company, the lake line working in the interest of the Central Vermont, has made the route to meet the competition of the barge lines transferring their grain at Kingston. By May 15 the Central Vermont will have its new million-bushel elevator at Ogdensburg ready for grain, giving a total elevator capacity of 1,500,000 bushels there. A large fleet of river barges has been built or chartered to carry the grain from Ogdensburg to Montreal. The barge lines running from Kingston have no elevators, the grain being unloaded from the lake vessels directly in to the barges, which are in turn unloaded directly into ocean steamships at Montreal. The new route will give ten days' storage at Ogdensburg, and do the transferring at one-fourth cent a bushel, the rate now charged at Kingston for transferring alone. In this way the holding of grain in barges at Montreal awaiting the arrival of the steamer and the difficulty of at all times having barges to unload lake vessels at Kingston will both be avoided. Grain can be sent forward from Chicago at any time and held at Ogdensburg until the ocean steamer is reported, the trip down the St. Lawrence to Montreal taking but three days.

The many friends of Mr. H. G. Thompson, for a number of years Assistant General Passenger and Ticket Agent of the Atchison at Topeka and Chicago, will be pleased to learn of his appointment as General Passenger and Ticket Agent of the Gulf, Colorado & Santa Fe, with headquarters at Galveston, Tex.

Traffic Notes.

The Philadelphia & Reading is now sending about 200 cars of coal a week to New England by way of Slatington and the Poughkeepsie Bridge route.

The chairmen of the Trunk line and Central Traffic Associations have given official notice that a new form of bill of lading has been adopted, to be used by all the lines after May 1.

Russell & Co., of Massillon, O., have sent a train of 26 cars of threshing machinery to Portland, Or., over the Pittsburgh, Fort Wayne & Chicago, Chicago, Burlington & Quincy and Union Pacific.

A lake and rail route has been formed between the seaboard and the Missouri River by way of Duluth, composed of the Fitchburg, the West Shore, the Northern steamship line, Great Northern Railway, and the Sioux City & Northern.

The Union Stock-Yards Co. of San Francisco has been incorporated with a capital of $2,500,000 to establish a stock-yard for collecting stock of all kinds for sale to a number of packing-houses to be established in the various coast cities, including Los Angeles, San Diego, Portland, Seattle and Tacoma.

Chairman Blanchard has just submitted to the roads in the Central Traffic Association revised rules governing milling-in transit. They differ little from those heretofore in effect, except that they more clearly define the conditions under which such business may be transacted.

The meeting of the Committee on Uniform Freight Classification, which was to have been held in Denver this week, has been indefinitely postponed. The Eastern members of the committee would have been unable to attend, as they have not made up their minds as to what action to take in view of the decision of the Inter-State Commerce Commission in the carload-lot cases.

The opening of lake navigation from Escanaba before vessels are able to come out of Lake Superior, has produced a great rush of boats at that port. Vessels with a capacity of over 100,000 tons were there last week and ore was being rushed from the mines to load them. The limited capacity of the railroads, however, drove some of the boats to Chicago, where they took corn at two cents a bushel to Buffalo.

Georgia merchants are complaining to the Railroad Commission because the Southern Railroad & Steamship Association forbids the examination, by prospective buyers, of carload freight billed "to order." The bill of lading must be indorsed with authority to examine the goods, or else it must be fully made over and delivered to the railroad before permission will be given to see the goods. The miller who desires to take a wagon load of wheat and grind it into flour so he can sample the biscuit made from it, and the farmer who wants to take a portion of a shipment of fertilizer and collect the pay for the crop he expects to raise with it, before paying the freight bill, will probably be heard from next.

The Chicago, Burlington & Quincy, beginning next Sunday, will resume the running of the train formerly known as "Burlington No. 1," which was taken off at the time the Western roads agreed to discontinue fast train service between Chicago and the Missouri river. It will leave Chicago daily at 1 p. m., and arrive at Denver at 6:30 p. m. the next day. This reduces the present running time on this road between Chicago and Denver from 36¼ hours to 29½.

The Louisville & Nashville has informed Chairman Finley, of the Trans-Missouri Association, that it cannot undertake to sell home-seekers' tickets over lines in that association unless the latter will reciprocate. Other Southern and Southeastern lines have sent similar communications to Chairman Finley declining to sell such tickets to the West unless similar tickets are sold by the Western lines to the South. A special meeting of the Trans-Missouri Association will soon be called to consider the subject.

Overland Rates on Tea.

The San Francisco Chamber of Commerce has complained to the Interstate Commission in relation to the rates on tea, alleging unjust discrimination in favor of foreign tea-shippers. It is shown that the rate on teas from Japan to New York is 1½ cents a pound, while from San Francisco to the same point it is three cents per pound. Attention is called to the circular issued by the Commission March 23, 1889, which reads as follows: Imported traffic transported to any place in the United States from a port of entry or place of reception, whether in this country or in an adjacent foreign country, is required to be taken on the inland tariff governing other freights.

All-Rail Freight Rates via the Soo.

The "Soo" Despatch line has announced freight rates from New York to St. Paul by way of the New York, Ontario & Western, embodying a reduction of 13 cents on the former all-rail tariff. The new tariff corresponds with that put in force last week by the Canada Atlantic Fast Freight Line, which also operates over the Minneapolis, St. Paul & Sault Ste. Marie. The rates via the New York, Ontario & Western are: 77, 63, 50, 39, 32, 27. The regular trunk line all-rail rates to St. Paul via Chicago are on the basis of $1 per 100 lbs. first-class. The "Soo" line is allowed a differential of 10 cents, making its rate 90 cents, on which the present figure is a reduction of 13.

The Interstate Commerce Commission.

The Commission, in an opinion by Commissioner Bragg, has decided the complaint of the Worcester Excursion Car Co. against the Pennsylvania Railroad Co. The question was whether or not, in case a railroad company has furnished to the public, by an arrangement with one car company, a sufficient supply of sleeping and excursion cars for all the business on its lines, it can be compelled, against its objection, to haul in its passenger trains excursion cars belonging to other private car companies. The Commission decided that it could not and dismissed the petition.

Freight Car Movement on the Lake Shore.

In March the average mileage per day for every Lake Shore freight car on the Lake Shore & Michigan Southern was 37 miles. This result is attributed to "location statements," devised by Mr. W. H. Canniff, the Assistant General Superintendent, and which have been in force on the road for several months. By the use of these statements every agent on the line reports by car number each car at his station at a specified hour. The report describes the kind of car, the number of days loading and unloading and also the number of days empty and the cause of detention. The reports are sent to Cleveland by train mail. Another report shows cars in transit, so that combining the two it is said that on a half hour's notice the total number of any kind of cars, flat, box, line, coal or foreign, on the road can be given with substantial accuracy. From the summary made each morning and laid on the desk the Assistant General Superintendent movements can be regulated.

Anthracite Coal Tonnage.

The following is the statement of anthracite coal production for the month of March, 1890, as compared with the same period last year, compiled from returns furnished by the mine operators:

	March.		
	1890.	1889.	Inc. or Dec.
From Wyoming region	1,056,477	1,221,251	D. 164,773
From Lehigh region	434,967	279,279	I. 155,687
From Schuylkill region	614,017	602,533	I. 11,484
Total.	2,105,461	2,103,063	I. 2,398
	Year.		
	1890.	1889.	Inc. or Dec.
From Wyoming region	3,092,543	3,634,668	D. 542,124
From Lehigh region	1,296,432	1,266,139	I. 30,293
From Schuylkill region	1,855,517	1,922,447	D. 66,931
Total	6,244,492	6,823,254	D. 578,762

The stock of coal on hand at tide-water shipping points, March 30, 1890, was 992,309 tons; on Feb. 28 it was 1,148,380 tons; a decrease of 156,071 tons.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, April 19, amounted to 72,405 tons, against 69,873 tons during the preceding week, an increase of 2,532 tons, and against 41,940 tons during the corresponding week of 1889, an increase of 30,465 tons. The proportions carried by each road were:

	W'k to Apr. 19		W'k to Apr. 12.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	6,191	8.6	7,831	11.2
Wabash	3,866	5.3	2,747	3.9
Lake Shore & Michigan South.	13,256	18.3	12,319	17.6
Pitts., Ft. Wayne & Chicago	7,505	10.4	8,545	12.2
Chicago, St. Louis & Pitts.	9,574	13.2	8,269	11.8
Baltimore & Ohio	4,484	6.2	5,771	8.3
Chicago & Grand Trunk	9,795	13 5	8,641	12.4
New York, Chic. & St. Louis	7,899	10.9	7,319	10 5
Chicago & Atlantic	9,835	13.6	8,431	12.1
Total	72,405	100.0	69,873	100 0

Of the above shipments 3,326 tons were flour, 36,712 tons grain, 2,935 tons millstuffs, 4,956 tons cured meats, 1,889 tons lard, 9,805 tons dressed beef, 1,162 tons butter, 1,308 tons hides, 106 tons wool and 6,680 tons lumber. The three Vanderbilt lines carried 37.8 per cent. of all the business, while the two Pennsylvania lines carried but 23.6 per cent.